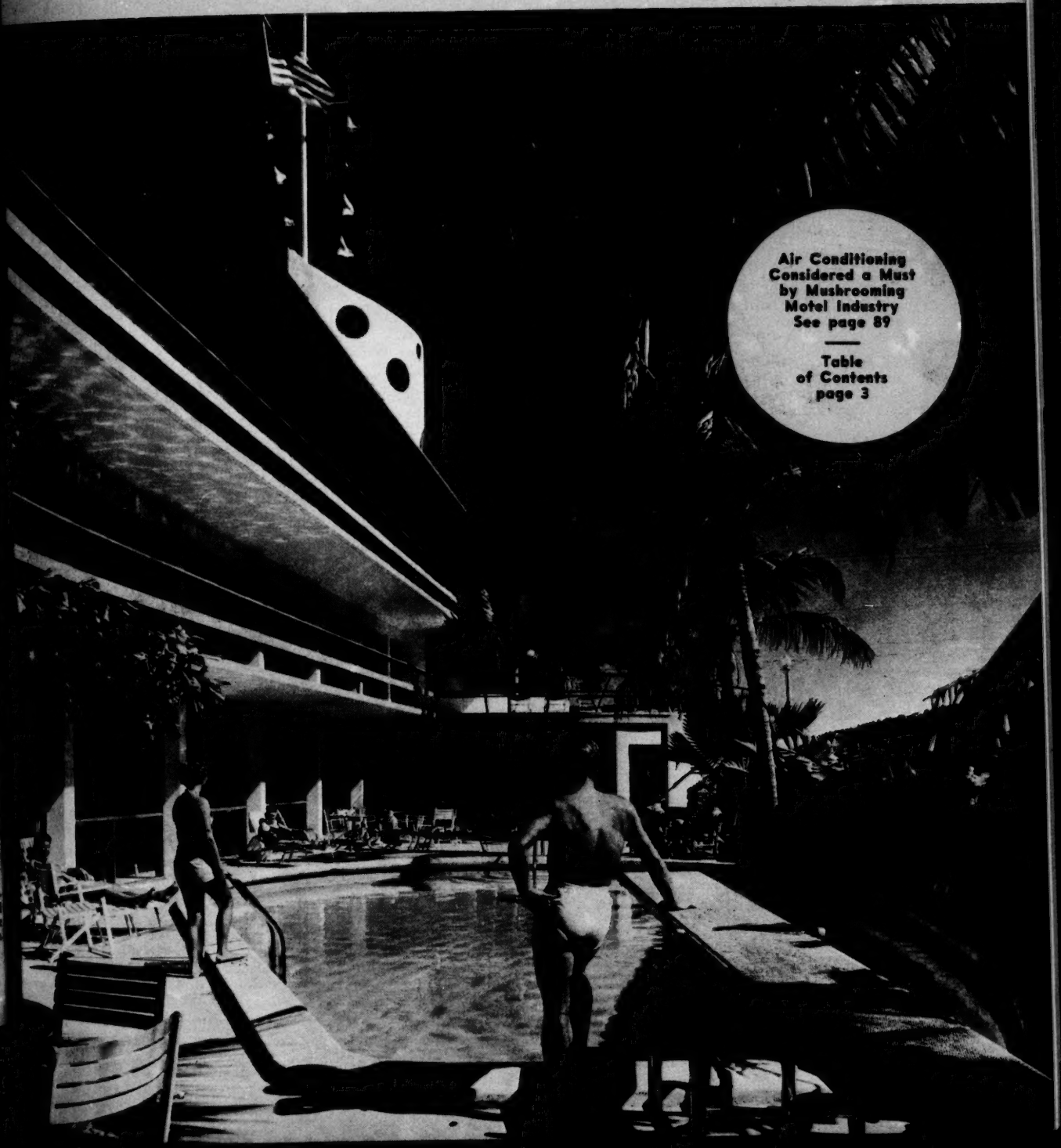
# AIR CONDITIONING HEATING AND VENTILATING

CTOBER, 1957—54th Year



Air Conditioning Considered a Must by Mushrooming Motel Industry
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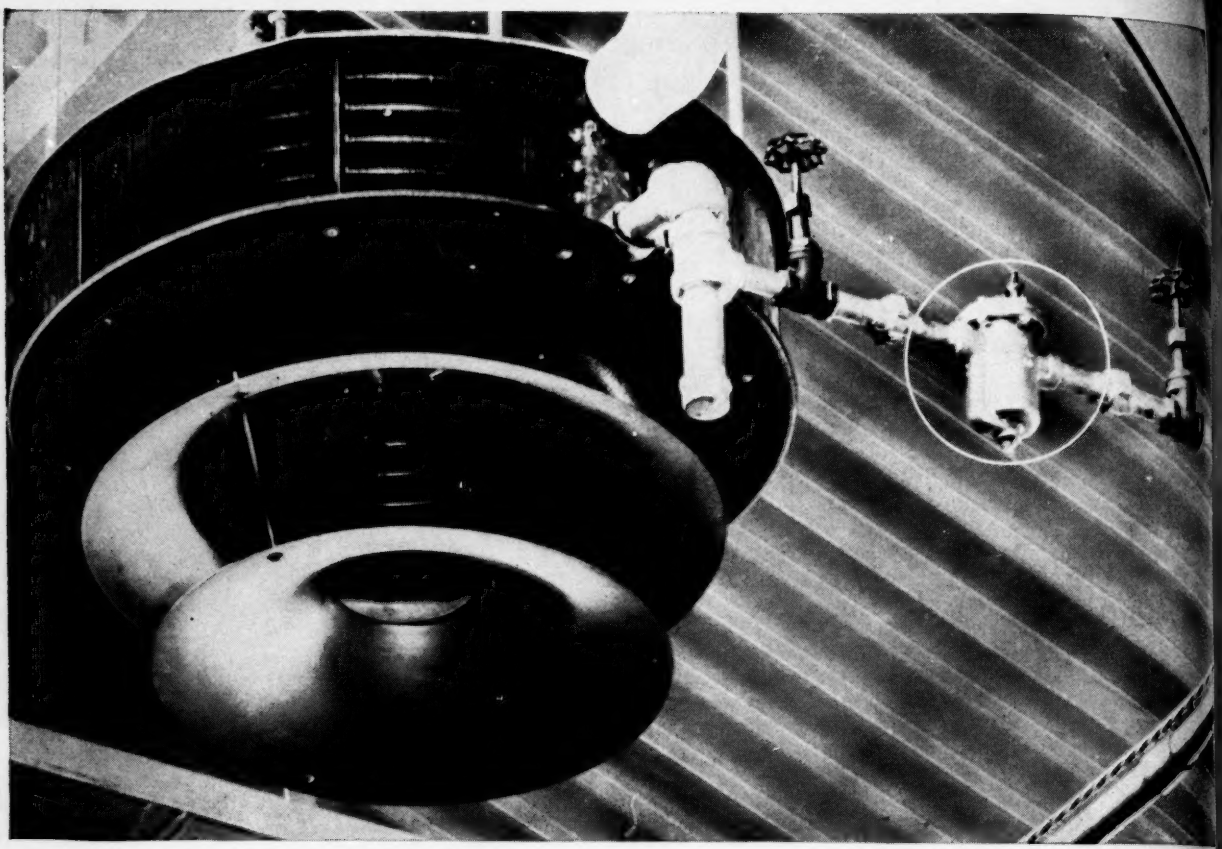


# Here's the Way to Trap a Unit Heater for Lots of Heat and Little Maintenance

The picture above is an outstanding guide to good unit heater trapping. This installation provides maximum heater efficiency and minimum maintenance time and cost.

**1. Simplified piping.** Horizontal in-line piping is made possible by the Armstrong side inlet—side outlet trap body. Note that the trap can be opened by removing the cap, without disturbing pipe connections.

**2. Dirt pocket ahead of trap.** The vertical pipe leg collects heavy dirt and scale. No strainer is needed because the self-scrubbing action of an Armstrong trap washes ordinary dirt right through it.

**3. Test valve.** The maintenance engineer can check this trap quickly and easily by opening the test cock shown installed in the trap cap.

**4. Shut-off valves and unions.** The trap can be repaired, or replaced with a spare trap, without shutting off any other units.

**5. Generous sized trap.** The Armstrong trap, selected from Table B-29 or C-29 in The Armstrong Steam Trap Book, provides a minimum safety factor of 3 to 1 for this job. Its big air handling capacity keeps the heater free of corrosion-producing air and $CO_2$, provides fast heat-up and full rated btu output. No lag—condensate is discharged at steam temperature.

**6. A good steam trap.** The Armstrong trap discharges condensate at steam temperature and it has large air venting capacity. The heater is always full of hot, dry steam.

The Armstrong trap mechanism cannot clog, bind, stick or collapse. Valve and seat are hardened chrome steel—all other working parts are stainless.

An Armstrong trap is rated conservatively on a basis of actual hot condensate capacity under job operating conditions. This is not true of all traps and is an important factor when comparing prices.

Armstrong traps are sold by factory-trained Representatives under an unconditional, money-back guarantee of satisfaction to the user.

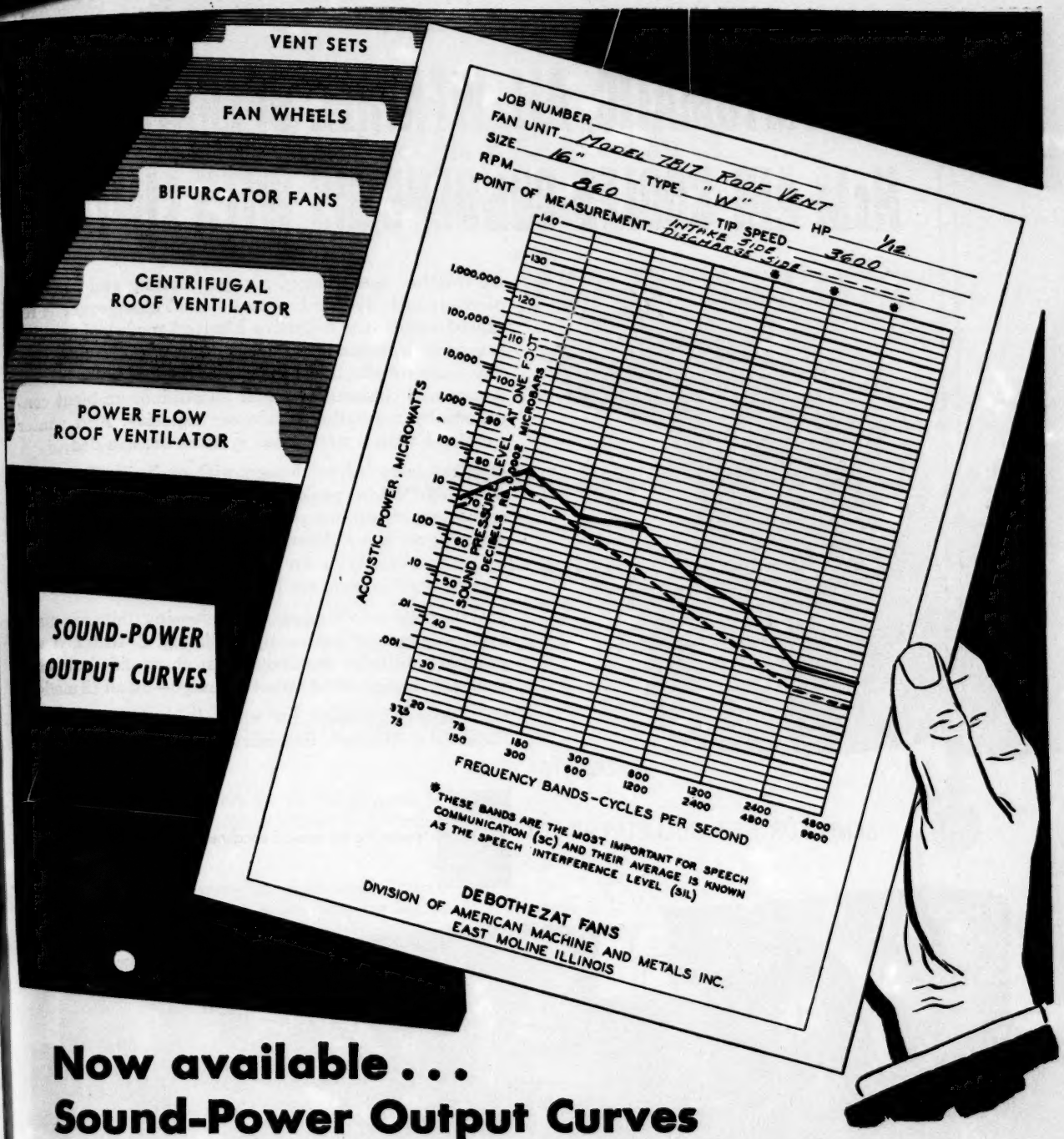
For the best in unit heater trapping, call your local Armstrong Representative, or write:

**ARMSTRONG MACHINE WORKS**
**8467 Maple Street • Three Rivers, Michigan**

**FREE — "How to Trap Unit Heaters" is the title of pages 28 and 29 in The Armstrong Steam Trap Book. This 44-page catalog is a guide to good trapping practice. Send for your copy.**

STEAM TRAPS FOR EVERY REQUIREMENT — APPLICATION ENGINEERED

**ARMSTRONG STEAM TRAPS**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EAST MOLINE ILLINOIS

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All DeBothezat fans are rated for noise on both the inlet and outlet sides.

These ratings are given in microwatts sound power and decibel sound pressure levels in each of 8 octave bands of frequencies, measured separately. Ratings are established by actual scientific tests conducted in DeBothezat's own reverberation rooms designed and calibrated by Armour Research Foundation.

This data is available on any size and type DeBothezat fan unit you may be interested in. And remember, DeBothezat fans' sound power ratings are based on actual reverberation room tests. Ask your DeBothezat Sales Engineer for complete information.

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A DIVISION OF

**American Machine and Metals, Inc.**

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**IN CANADA: Represented by DOUGLAS ENGINEERING CO., Ltd., Toronto • Montreal**

*SO HALSTEAD & MITCHELL ENGINEERS SAID . . .*

# FOR AUTOMATIC, ALL-WEATHER OPERATION USE H&M AIR-COOLED CONDENSERS WITH LIMITROL

All-weather operation of air conditioning and refrigeration units is automatic—no manual changeover is required—when the exclusive Limitrol modulating valve is used with Halstead & Mitchell's air-cooled condensers. The Limitrol effectively maintains balance between condenser and compressor under all outdoor ambient conditions by regulating condenser capacity. And winter problems with water-cooled systems are avoided.

H&M's air-cooled condensers with exclusive Turbu-Flo fin design allow peak Btuh at the evaporator. The embossed, streamline pattern provides better air wash, reducing air film resistance, and improving heat transfer by up to 15%. Wide fin spacing assures rated capacity longer. Service costs are less, too.

Installations involving many condensing units are made much easier and less costly. Halstead & Mitchell will provide multiple circuiting to meet specified requirements (if requested) at no extra charge—on all 12 models.

Call your wholesaler for more information or write Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.

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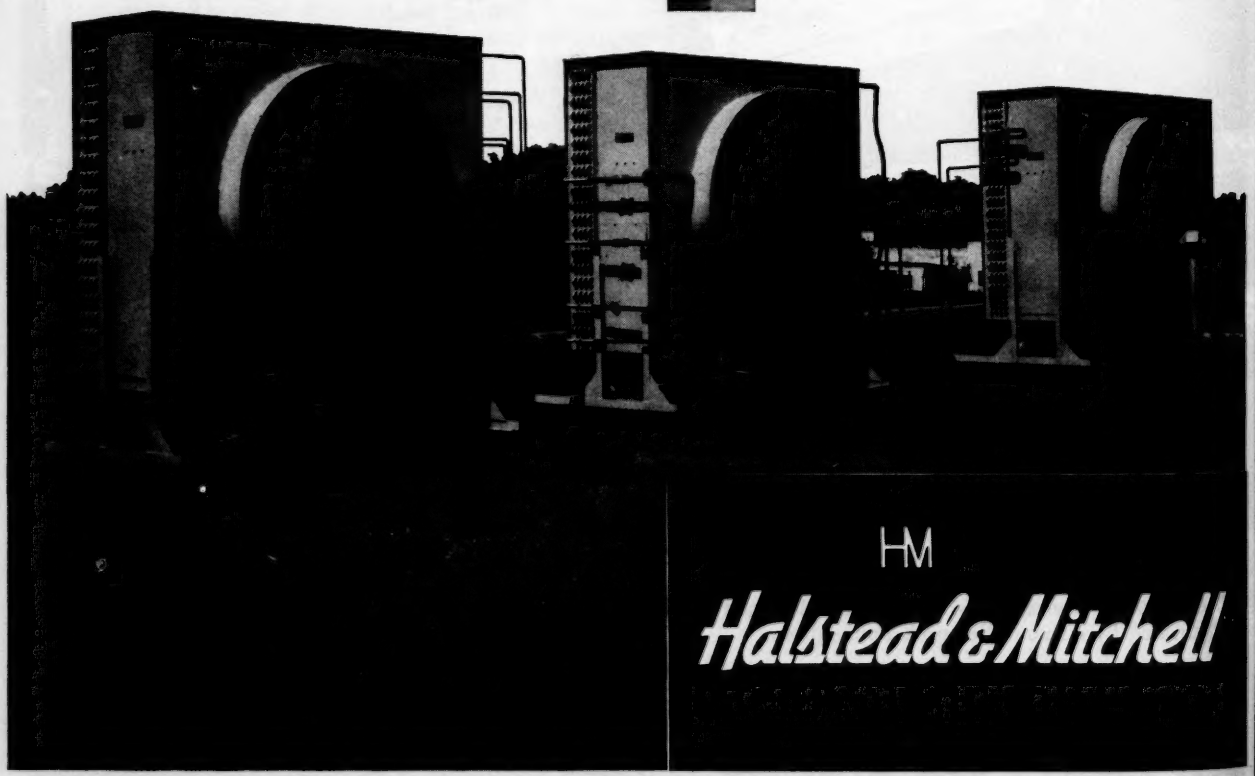
*'Turbu-Flo air-cooled condensers for remote installations'*



H&M

Halstead & Mitchell

# AIR CONDITIONING HEATING AND VENTILATING

OCTOBER, 1957

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**The Cover:** Modern motels provide luxury accommodations and recreation facilities. This one is located in Florida. See article, Air Conditioning for Motels, page 89.

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# HIGH SPOTS

• The **American Society of Refrigeratng Engineers** will hold its 44th **Semiannual Meeting** November 14-16 at the Shoreland Hotel in Chicago, Ill. Central Plant Air Conditioning for Multi-room Buildings appears on the air conditioning conference agenda for the first time. Methods of using aluminum for both tube-in-sheet and tube-on-sheet practice will be covered by several speakers at the domestic refrigerator engineering conference There will be six forums candidly approaching such themes as refrigeration in candy manufacture, automatic operation of refrigating plants, the part ASRE can play in industry to encourage interest in refrigerating engineering education, problems of correct installation of residential air conditioning, and small truck refrigeration equipment. There will be eight papers at the three technical sessions. Topics will be thermal conductivity apparatus for operation near room temperature, influences of insulation in moisture condensation aspects of a steel warehouse, greenhouse climate control, air cycle air conditioning of the B-47, a moisture indicating device for refrigerating systems, permeability of plastics films to Refrigerant 12, and removal of ice films.

•

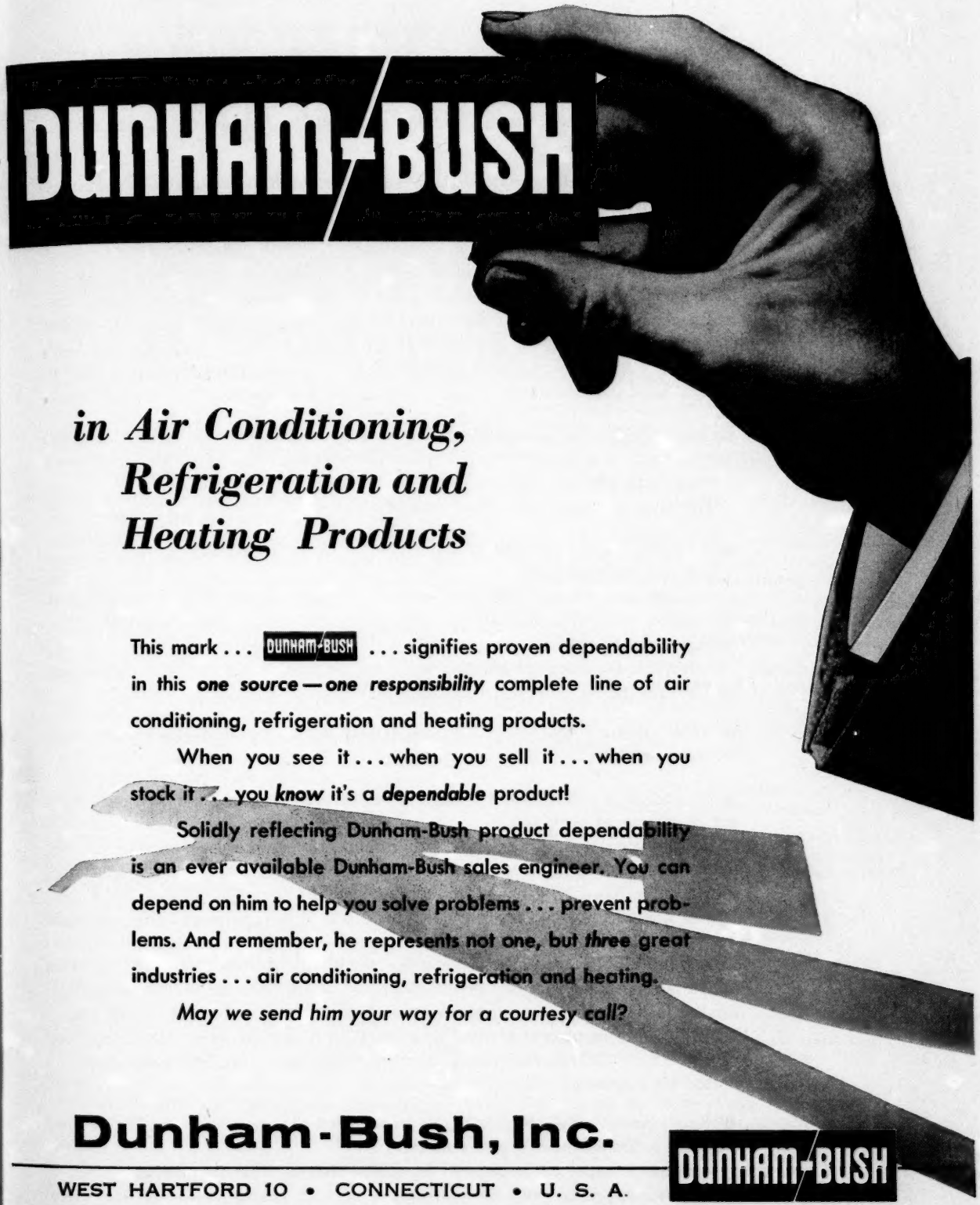
• Symposiums, a topical session, and papers of timely interest form the substance of the technical sessions planned for the **64th Annual Meeting of the American Society of Heating and Air-Conditioning Engineers,** January 27-29 in Pittsburgh, Pa. at the Penn-Sheraton Hotel. The Council and various committees will meet between January 25 and 29. The organization meeting of the 1958 Council will be on Thursday, January 30. Introduction and installation of the 1958 officers and presentation of the Past President's Award are among the highlights of the Annual Banquet to take place Wednesday evening, January 29.

• Recent approval of a new **low-energy safety circuit wire,** for use in circuits serving furnaces, boilers, and other heating safety-control devices, by both American Gas Association laboratories and Underwriters' Laboratories will result in considerable savings, it was said. Inspectors need no longer apply Section 7267 of the National Electric Code, requiring mechanical protection of safety-control wiring, to require additional armor (tube or conduit) where such circuits operate at low voltage with limited energy.

• Stockholders of **Servel, Inc.,** approved the sale for about $4 million of the company's All-Year Air Conditioning Division to Arkansas Louisiana Gas Co., Shreveport, La. Business, property, and assets of the Division are included plus Servel's Defense Division building, all in Evansville, Ind. Authorized by the stockholders to dispose of the rest of the company's assets, the company states it will use the proceeds to acquire new and different types of business. Gas utility executives are considering the prospects for future production of the Servel **refrigerator,** the only gas model manufactured. There are 3,000,000 of them in use, or 6% of all refrigerators in the country. It is hoped that another manufacturer will acquire the line.

• Housing Markets, monthly report of Housing Securities, Inc., predicts that the surge in **apartment house construction** will continue for some time because of (a) relatively low volume of multiples built during the last six years created a sizeable backlog, (b) the ever growing scarcity of suitable land within reasonable distances, and (c) increased operating cost of homes makes rentals more competitive.

# *Mark of Dependability...*

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# WASHINGTON OVERTONES

by LORING F. OVERMAN

● It was intermezzo time in Washington as Summer faded into Fall.

Washington seemed in a state of suspended animation. Yet observers knew that only the warm kiss of "Politics 1958" would be needed to arouse the sleeping entourage of Big Government.

Folks in the air-conditioning, heating and ventilating field were finding the following of interest:

● All legislation left uncompleted by the adjourning 85th Congress, First Session, remains "live." When the second session convenes in January action on pending legislation will continue just as though there had been no adjournment to interrupt.

● Principal difference is that action next January may not be the same as it might have been if a vote had been taken prior to adjournment. Reasons: voters have had a chance to make their viewpoints known; changing times may have altered circumstances; coming Congressional elections may have cast their shadows. (All members of the House, and one third of all Senators are up for election in the Fall of 1958).

● How Members of Congress vote on matters affecting the air conditioning and heating-ventilating industries will depend upon whether legislators know industry's position, and whether industry can back its requests with votes.

There were many things worth watching:

● Congress faces somewhat of a dilemma in its 1958 program.

—voters want tax cuts.

—voters want balanced budgets, economy in government, reduced expenditures.

—voters want their own special projects carried on by some brand of federal magic, without postponing tax cuts and without adding to the budget.

—whether the threat of **inflation** will grow or subside has not been determined. Neither has the possibility that **deflation** may become a major problem.

● How Congress will act will depend largely on the business atmosphere, come January and later.

● Uncertain of future trends, Congress has favored interim legislation on a number of important projects.

Housing legislation, for example, was extended for only a year; must be renewed before next summer's adjournment. House Banking subcommittee plans hearings in March or April. By that time, business should know whether new FHA regulations are effective. (They provided for lower down payments and settlement charges, higher interest rate, discount controls).

Possibility of improvement in housing situation was seen in Bureau of Labor Statistics reports for August. Private housing starts topped the million annual rate for the first time this year. Seasonally adjusted, starts reached an annual rate of 1,010,000—three percent above July's 980,000; 8 percent above March low level of 933,000. Rate, however was 11 percent below the 1,136,000 annual figure reported for August of 1956.

● Small business legislation will also be required next year—present life of Small Business Administration expiring in 1958.

—House is expected to demand legislation making SBA permanent.

—Senate approved only one-year extension, with House concurring because of iminence of adjournment.

*(Continued on page 8)*

# How to Reduce CONDENSATION!

## Prevent Damage to Wood, Plaster, Paint, etc.

**Condensation forms when temperature of contacting air is reduced below dew-point by a cold surface.**

**Condensation forms when the capacity of an air space at a given temperature is too small for the amount of vapor present.** →

As air becomes colder, it can hold less vapor in suspension. The degree of saturation increases until a dew-point is reached and condensation occurs.

Heat flows from warm to cold by conduction. A material in contact with air colder than itself on one side, warmer than itself on the other side, will *continuously* extract heat from the warmer air by conduction and lose it to the colder air. As the contacting warmer air becomes cooler, the amount of vapor it can hold in suspension without condensing becomes smaller.

The denser and bulkier the material, the more heat it can extract before attaining room temperature, if it *ever* does. The scientific construction of multiple layers of aluminum and air spaces minimizes condensation formation on or within this type of insulation.

### THE REASON CONDENSATION IS MINIMIZED

Since the first layer of aluminum adjacent to the warm, inner air of a building weighs only about ¼ oz. per sq. ft., it does not need to extract much heat from that air to attain and remain at room temperature. The emissivity of the aluminum surface is only 3%, so little heat is lost by radiation. This helps the aluminum to remain at about room temperature and not extract much heat from that warmer air.

The other sheets of aluminum and fiber retard heat flow by inner as well as outer convection, and conduction is slight through the preponderant low density air spaces. So the aluminum's other surface faces a space colder than the aluminum itself. Because warmth flows to cold in conduction, the aluminum will *give off a slight* amount of *heat* to the colder space, slightly *increasing* the vapor retaining capacity of that space. The successive reflective spaces and layers of aluminum behave similarly. Since each aluminum surface is slightly warmer than the air it faces on its cold side, no heat is extracted from the colder air; *the reverse is true.*

### CONTINUOUS VAPOR BARRIER

When *scientific,* joist-to-joist multiple aluminum is used, fortuitous vapor and water (like rain) which intrude into exterior building spaces will, as vapor pressure develops therein, gradually flow out as vapor, through exterior walls and roofs because vapor flows from areas of greater to less density. The vapor, unable to back up through the long, *continuous, almost impervious* aluminum, will flow out, because exterior walls and roofs have substantial permeability in comparison with aluminum, far greater than the required 5 to 1 ratio. Infiltration under its flat stapled flanges is slight.

The U. S. Bureau of Standards has prepared a helpful and informative booklet, "Moisture Condensation in Building Walls," which deserves your attention. Use the coupon to get a free copy from us.

**THERMAL VALUES**
**Infra Type 4 Parallel Insulation**

**Up-Heat C .105*=3⅛" non-metallic insulation†**
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**Down-Heat C .042*=7⅞" non-metallic insulation†**

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Can be purchased everywhere through your preferred local dealer.

*Determined by method of National Bureau of Standards in H.H.F.A. Research Paper 32.
†Calculated on basis of limiting thermal values cited in Fed. Specs. LLL-f-321b; HH-I-585; HH-I-521c; HH-I-551a.

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## WASHINGTON OVERTONES *(Continued from page 6)*

● Next year's housing legislation:

—Principal question will be how to bring home purchase within range of that important multiple voting force, the "little" man.

—Answer lies in trend of government fiscal policies—whether inflationary or deflationary trends dictate tightening or loosening the reins on money supply.

—Again, there will be proposals to tap, as source of mortgage loans, the vast federal pension funds.

—Public housing arguments will be up again, with present program authorizing 36,000 units a year expiring in 1958. Senate is investigating possibility that multi-unit public housing should be replaced with single-family houses in medium price range.

—Another "possible" would encourage urban building by helping cities finance community facilities—sewers, reservoirs, etc. More aid for urban renewal (polite term for slum clearance) is another possibility.

● School construction will again be the subject of lively debate.

—Recent action in Arkansas will spotlight the possibility of conflict between State and Federal governments if schools are constructed with help of Washington.

—National Education Association, with headquarters in Washington and tens of thousands of teacher-members throughout the country, is sponsoring a grass-roots campaign for federal aid to school construction.

● From at least three angles, the spreading federal highway program is forecasting increased opportunity for heating, ventilating and air-conditioning people:

—New highways are opening up isolated industrial areas; clearing the way for factory and warehouse construction requiring plumbing, heating and factory air conditioning.

—Highway network is creating new shopping centers and suburban residence areas; commercial and residential equipment indicated.

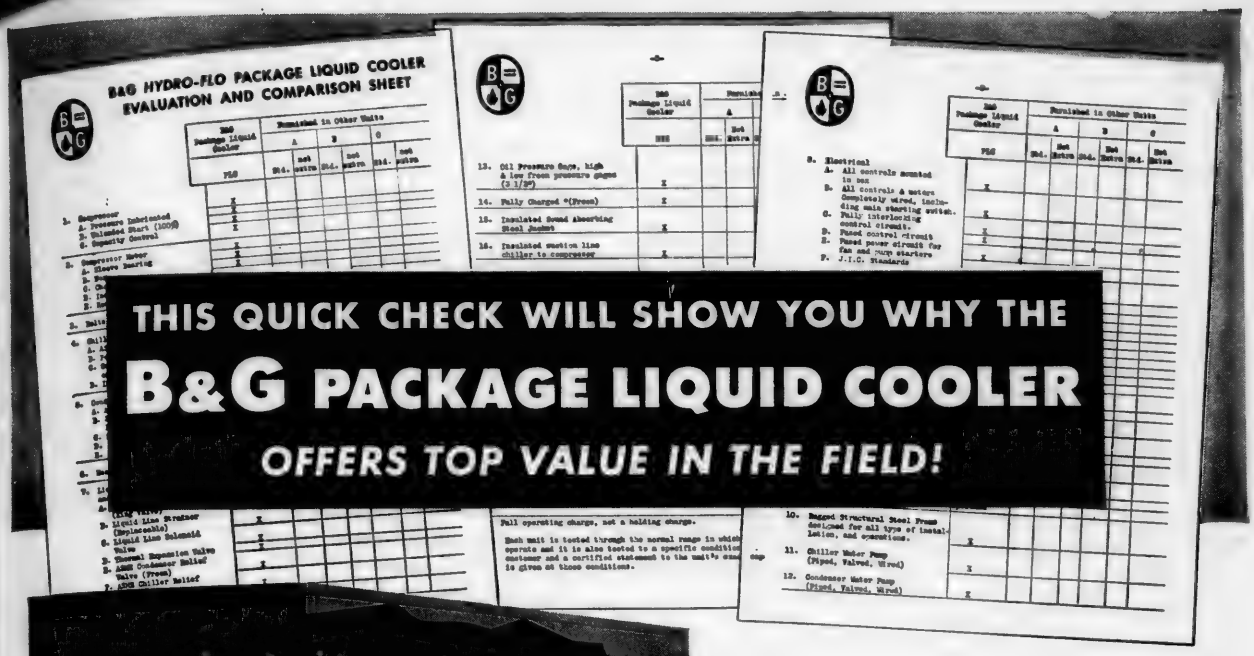
—Smooth new roadways encourage luxury travel, including air-conditioning of automobiles themselves. Data released early in September by Washington's Air Conditioning and Refrigeration Institute reveal mushrooming popularity of auto air control. For the first five months of this year automotive-type compressors shipped numbered 257,603, compared with 140,525 during the comparable period last year. Rapid increase in the number of automotive-type compressors is evidence of growth in public acceptance of air-conditioned automobiles.

● Next to the gain made by automotive compressors, ACRI reported increasing shipments of 1 and 2-horsepower compressor bodies for the five-month period—decreases for all fractional horsepower compressors. Greatest gain was in 2-hp sizes—142,126 for the period, as against 38,950 for same period of 1956.

● A research report evaluating air cycle cooling systems has been released for civilian use by the Armed Services. The report involves the application of expander-compressor air cycle cooling systems for aircraft air conditioning. Proposed is a method of air cooling whereby air temperature is reduced by expanding it adiabatically through an expansion turbine. Report is available at 75 cents from Office of Technical Services, Commerce Building, Washington 25, D. C. Title: "An Expander-Compressor Method of Air Cooling" (PB 121926).

● Air Conditioning and Refrigeration Institute has announced that the half-way mark has been passed in a nationwide test to determine average monthly cost of heating and air-conditioning a typical American home. Preliminary figures on 120 or 172 houses included in the test place the **average year-round monthly cost** for heating and cooling at $10.64.

ARI points out that the survey indicates need for air conditioning industry to consult with builders to encourage home designs providing maximum efficiency for heating-cooling units.

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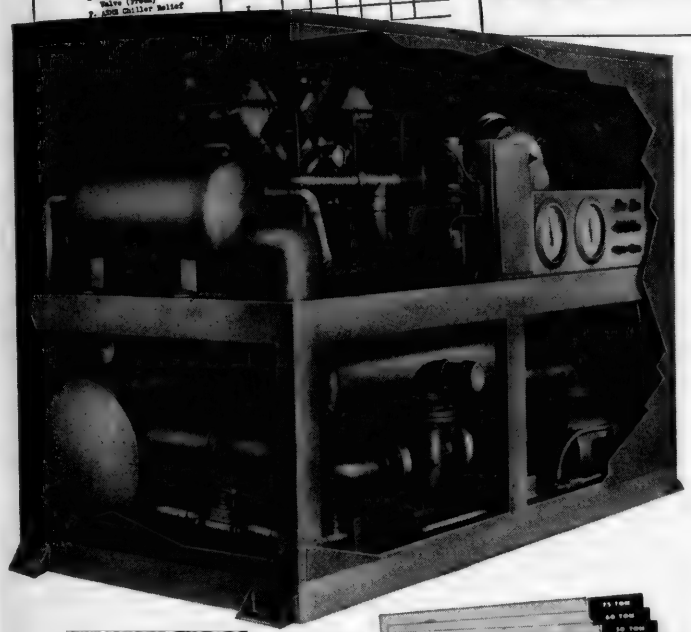


Send for a set of Evaluation Charts as illustrated above—compare the *standard* equipment of the B&G Package Liquid Cooler with that of any other. You'll see for yourself that *you can buy B&G quality at smaller installed cost!*

With this *completely packaged* unit, costs which might otherwise be charged against the job are eliminated. For example—

**No inside wiring costs.** The finest electrical controls are furnished, *completely wired and fully interlocked!*

**No inside piping costs.** Both chiller and condenser pumps are sized to specification, mounted, piped and electrically interlocked.

**No structural framing costs.** All equipment is mounted on a rugged steel frame—a permanent base.

**No metal forming costs.** Standard equipment includes a heavy gauge steel jacket with sound-deadening undercoating and Hammerloid finish.

**No insulating costs.** The suction line and heat exchanger are fully insulated.

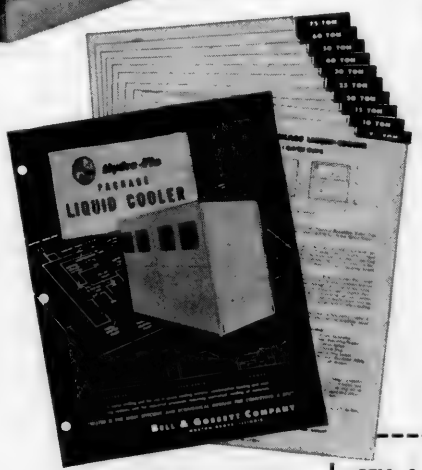
**No testing costs.** Fully tested under specified operating conditions and also under varying load conditions. All valves adjusted and balanced.

**No extras to buy.** Standard equipment includes gauges, compressor motor, all belts, driving sheave, compressor fly wheel, increment start, full sized heat exchanger and full operating charge of Freon.

**Capacities: Ten units from 7½ to 75 tons**

**COMPLETE FILE OF SPECIFICATION AND APPLICATION DATA**

Engineering data, specifications, evaluation charts, typical applications and prices on the B&G Package Liquid Cooler are included in this file. Send the coupon for your set.

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# BRIEFLY STATED

AMONG THE ENGINEERS—Peter H. Clayton, formerly of New York, has become general counsel to JOHN F. MEISSNER ENGINEERS, INC., Chicago, Ill. He and Robert C. Meissner will create a public relations department for the firm . . . Joe H. English, registered professional mechanical engineer, announced the change in name only of Everett Engineering Co. & Easco-York to ENGLISH ENGINEERING COMPANY, MECHANICAL CONTRACTORS, Abilene, Tex. . . . Leland S. Rosener, Jr., Engineers, have become ROSENER ENGINEERING INCORPORATED, ENGINEERS AND ARCHITECTS, San Francisco, Calif.

WITH THE INSTITUTES AND ASSOCIATIONS—New officers of BUILDING RESEARCH INSTITUTE (BRI) are President Charles H. Topping, senior architectural and civil consultant for E. I. du Pont de Nemours & Co., Inc., Vice-President Harold L. Humes, vice-president of Baldwin-Hill Co., Trenton, N. J., and Executive Director William H. Scheik . . . Members of the INSTRUMENT SOCIETY OF AMERICA, Pittsburgh, Pa., met last month in Cleveland, Ohio, for the Society's 12th Annual Meeting and 12th Annual Instrument Conference and Exhibit. Robert J. Jeffries, assistant to the president of Daystrom, Inc., Murray Hill, N. J., assumed the presidency. Henry C. Frost, assistant chief engineer of Corn Products Refining Co., Chicago, Ill., is the new president-elect-secretary. Ralph D. Webb, head of the instrument department of Union Carbide Chemicals Co.'s South Charleston plant and veteran of 33 years in the instrument field, was elected to honorary membership, the highest honor bestowed by the Society . . .

A total of 770 exhibit spaces, divided between the Conrad Hilton and Sherman Hotels, and the Chicago Coliseum will be manned by manufacturers of home building materials, equipment, and appliances, and by service organizations during the 14th Annual Convention-Exposition of the NATIONAL ASSOCIATION OF HOME BUILDERS OF THE UNITED STATES during January 19-23. The annual show, largest of its kind in the nation, may eventually assume an international flavor. Several foreign firms and governments have expressed interest in exhibiting at future meetings . . .

Edward R. Teske, Glenview, Ill., is executive secretary, MECHANICAL CONTRACTORS CHICAGO ASSN., succeeding the late Thomas M. Cunningham, who died August 11 following a brief illness . . . Industrial health problems will be discussed at the 22nd Annual Meeting of INDUSTRIAL HYGIENE FOUNDATION, Mellon Institute, Pittsburgh, Pa., on the 30th and 31st of this month. Papers at the engineering conference will discuss materials and methods for proper ventilation, dust modifications to decrease maintenance and corrosion, control of oxides of nitrogen in automobile exhaust, noise reduction, neutron activation, and engineering factors of fan installations.

NEW ADDRESSES—Since September 9 the executive offices of ROBERTSHAW-FULTON CONTROLS COMPANY have been in the Life Insurance Company of Virginia Building, Richmond . . . FRICK COMPANY'S branch office in St. Louis, Mo., moved to Room 500, 1221 Locust St., St. Louis 3. Branch manager there is John H. Carter . . . SARCO COMPANY, INC., and SARCOTHERM CONTROLS, INC., set October 1 as moving date for their national headquarters from the Empire State Building to expanded facilities at 635 Madison Ave., New York City . . . The BABCOCK & WILCOX COMPANY'S TUBULAR PRODUCTS DIVISION announced moving of its Syracuse office to Romax Building, Syracuse 3, N. Y., and its Boston office to 66 Central St., Wellesley 81, Mass.

BURGEONING BUSINESS—Operators were slated to commence the first of this month at YOUNGSTOWN SHEET AND TUBE COMPANY'S tube mill located at the company's Indiana Harbor Works, East Chicago, Ind. A rotary furnace, used to heat billets before they are fed into the piercing mill is said to be capable of handling a larger tonnage of billets than any similar furnace ever before built . . . Ground was broken by WALWORTH COMPANY, New York City, for its new $5-million brass valve plant and research and engineering center at Braintree, Mass. The two new buildings, scheduled for completion late in 1958, will consolidate many of the company's operations presently performed in 18 buildings in Boston . . . TUBE TURNS DIVISION OF NATIONAL CYLINDER GAS COMPANY will increase its manufacturing area approximately 40% by converting buildings on property adjacent to its main plant.

NEW REPRESENTATIVES—Richard S. Vinsant, 73 Broadmoor Dr., Little Rock, Ark., is appointed MCQUAY INC. representative for heating and air conditioning products in the Arkansas territory. He was formerly associated with Hurston-Conaway Company, the McQuay representative in Memphis . . . THE WIREMOLD COMPANY, Hartford, Conn., announces the following representatives of its Air Duct Division: Pearsall Co., Detroit, Colo., to handle its line in Colorado and Wyoming; Air Products Equipment Company, Chicago, Ill., to represent the company in Illinois and Indiana; and Kenyon-Barstow Company, Boston, Mass., for Massachusetts, New Hampshire, Rhode Island, and Vermont . . .

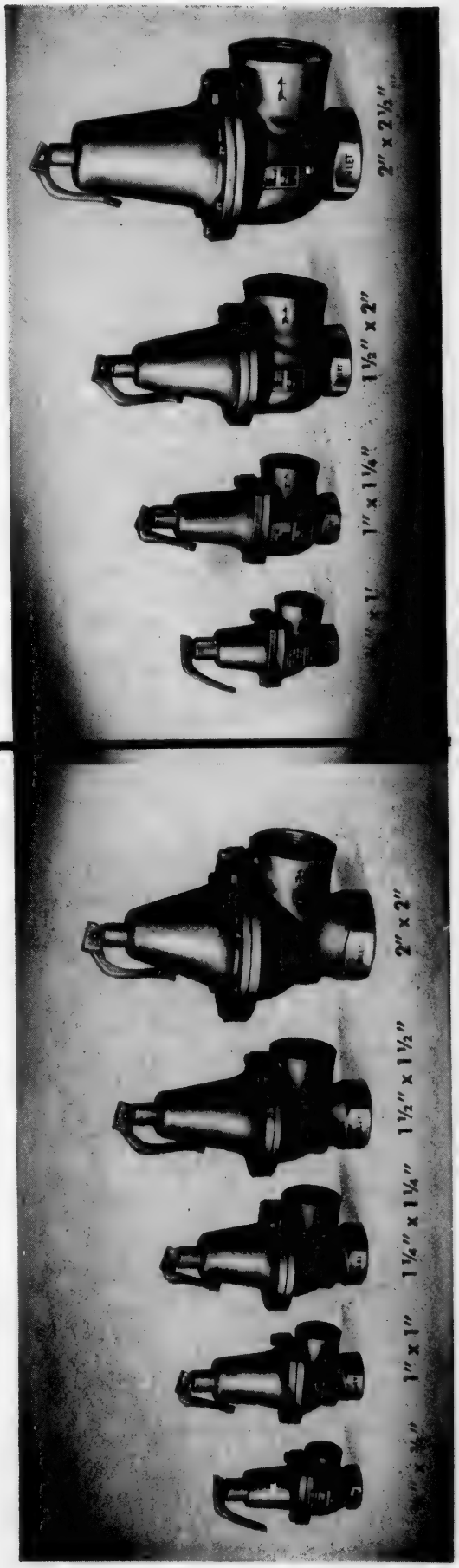
D. E. McCulley Company, Omaha, Neb., A. J. Hamilton, Bridgeport, Conn., E. K. Strahan, Inc., New Orleans, La., H. Dewey Jones Co., Columbus, Ohio, and General Equipment Co., Spokane, Wash., are new representatives of BUENSOD-STACEY, INC., for its line of dual-duct air mixing units and other products . . . Representing HALSTEAD & MITCHELL, Pittsburgh, Pa., in Georgia, Alabama, South Carolina, and Tennessee, with headquarters in Atlanta, Ga., is W. B. Knox of W. B. Knox Associates. Mr. Knox had spent ten years with Alco Valve Company . . . Appointment of Frank Hockett, Mesa, Ariz., as sales representative of THE FAIRBANKS COMPANY, New York City, was announced. He has owned his own supply business in Greensboro, N. C. . . .

*(Concluded on page 12)*

**new**

# A.S.M.E. *RATED*

## Pressure Safety Relief Valves



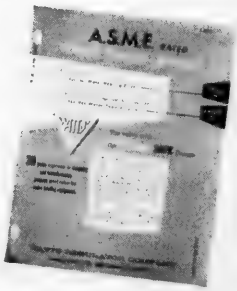

**No. 74A-740 Series —** EXPANDED OUTLETS

These valves have large internal flow areas and increased outlets to afford individual relief valves with exceptionally high BTU/HR steam discharge capacity ratings. They are especially designed and rated for hot water *space heating boilers*.

**174A Series —** Same size inlet and outlet connections

174A Series afford complete pressure protection for the great majority of all hot water *heating* and *supply* boilers with a single valve. The completeness of 174A Series, No. 74A, and 740 Series line makes it possible for you to meet the smallest or largest requirements for pressure protection from one line of valves.

For complete Specifications, Ratings, and Application Information on A.S.M.E. Rated Valves . . .




*Send for* **F-ASME**

## WATTS REGULATOR COMPANY

*Lawrence, Massachusetts*

Plumbing and Heating Safety Valves and Controls

## BRIEFLY STATED

*(Concluded from page 10)*

Mashall & Wells Company, headed by Tobert L. Wells, Grand Rapids, and Air Engineering Company, Kalamazoo, headed by Frank K. Platt, have consolidated their operations, with Air Engineering emerging as the principal firm. With main office in Kalamazoo, and branches in Grand Rapids and South Bend, Air Engineering will represent AMERICAN AIR FILTER COMPANY, INC.

AMONG THE MANUFACTURERS' PERSONNEL—Robert W. Carvell is added to the sales staff of HENRY VALVE COMPANY, Melrose Park, Ill. As sales supervisor of its new Industrial Division, Carvell is to head the company's expanded program on high pressure forged steel fittings and valves for industrial application . . . James J. Barrett is appointed manager of extrusion sales for THE BABCOCK & WILCOX COMPANY's Tubular Products Division. He will be at the company's Beaver Falls, Pa., general offices . . .

A. M. BYERS COMPANY announced that Norbert J. Connors, former president of Connors Steel Warehouse, Inc., has joined their steel sales department. Recently The General Tire & Rubber Company, majority stockholder in Byers, announced they intend to put greater emphasis on Byers' specialty alloy and stainless steel business. A program to increase quality and service is already underway, and Mr. Connors is the second top steel man to join the company within that week . . . Election of Joseph R. Denton as vice-president, New York District Sales, is announced by COCHRANE CORP., Philadelphia, Pa. A chemical engineer, Mr. Denton had been associated with Calco Chemical and Worthington before he became manager of the New York office for Cochrane . . .

R. W. Fink is the new chief engineer of NATIONAL VALVE AND MFG. CO. (NAVCO), Pittsburgh, Pa. He has been with the company for 20 years, is currently working on an American Standards Association subcommittee to revise the Code for Pressure Piping . . . Managing NATIONAL-U.S. RADIATOR CORP.'s Heating and Air Conditioning Division's Indiana branch office is T. J. Williams. The Indianapolis branch is headquarters for a sales and service group that covers the entire state . . .

S. Merle Hardison is appointed district manager in Philadelphia for TUBE TURNS, Louisville, Ky. He succeeds W. E. Geiser, who has returned to the headquarters staff in Louisville to take an important part in the company's expansion program . . .

Robert W. Thomas, a member of THE TRANE COMPANY Los Angeles office since 1950, is promoted to manager of the firm's New York office . . . The appointment of Joseph L. Ulman as chief engineer of ROBERTS-GORDON APPLIANCE CORP. of Buffalo and Canada was announced . . .

Appointed as sales manager for MARSH INSTRUMENT COMPANY, Skokie, Ill., Robert E. Barnett had joined the company's sales staff in 1941, was appointed assistant sales manager in 1950 . . . H. D. CONKEY & COMPANY, Mendota, Ill., announced the appointment of Harry J. Potter as manager of sales of the Field Control Division of the company. Clarence W. Potter, for many years manager of sales for this division, has retired from active participation but will continue in a consulting capacity . . . William B. Cott is named assistant to the vice-president of WESTINGHOUSE ELECTRIC CORP.'s air conditioning division at Staunton, Va., and will assume responsibility for the division's wholesaling branch operations. He continues to serve as manager of applied equipment department, a post he has held since 1955 . . .

BURNHAM CORPORATION Heating and Cooling Division has appointed Walter H. Sampson marketing manager, a move from his former post as Metropolitan New York branch manager. Phillip Barrett, formerly branch sales representative for the Southern Connecticut territory, succeeds him in New York. Both will be at the company's general offices in Irvington, N. Y. . . . Effective September 1, Robert H. Chittin, Short Hills, N. J., has been named assistant staff manager-tube for CHASE BRASS & COPPER COMPANY, Waterbury, Conn. He started with Chase as a warehouse employee and foreman at Cleveland, Ohio, in 1931 . . .

Covering the Southern Florida and Caribbean Island territory for DUNHAM-BUSH, INC., West Hartford, Conn., newly appointed sales engineer Ray Ferron previously was associated with Hill-York-Broward Company, Fort Lauderdale . . . Branch manager of AMERICAN AIR FILTER's Boston office, W. N. Murray succeeds Robert E. Reid, who has been appointed special sales engineer for the firm, working out of the Boston office. At the same time, two reassignments, that of Frank A. Stanton and Dale D. Briggs for Herman Nelson unit ventilator sales are announced, the former to cover the Middle Atlantic states, the latter serving in the Central States . . .

Three sales appointments, filling vacancies created by retirements, are announced by CRANE COMPANY, Chicago, Ill. G. G. O'Rourke becomes manager of the pottery and enamelware section, C. T. Rydelek becomes manager of transportation sales, and Ben F. Bowles is manager of hospital sales. Mr. O'Rourke succeeds Fred J. MacKenzie, who retired after 38 years service.

● JOHNSON-WILLIAMS, INC., Palo Alto, Calif., has completed negotiations with HEILAND DIV., MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, Denver, Colo., to takes over sales and servicing of the Heiland gas indicator. Heiland has been far removed from the gas indication field since it became part of M-H. It was the division's concern that sales and continued service be delegated to a reliable organization.

● O. A. Kroos, executive vice-president of Kohler Co., Kohler, Wis., and nationally known in the plumbing fixtures industry, died of a heart attack September 3, while on a fishing trip in Northern Wisconsin. He was 76.

● John R. McConnell, former vice-president and director of advertising of American Air Filter Company, died Thursday, August 8, following a short illness. He was 69, had retired last year after 33 years in the air filter business. He had been secretary-treasurer of Air Filter Institute.

# NOVELTY breaks the

## Life Quality Price barrier

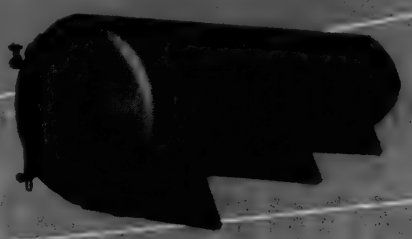
Now—Novelty's products offer Longer Life—Higher Quality—at Lower Prices.

Novelty has combined its fifty years of building unfired pressure vessels and storage tanks—with ten years of developing a complete line of Novelon Linings to bring you vessels that will give you corrosion protection available heretofore only with expensive alloys and clads.

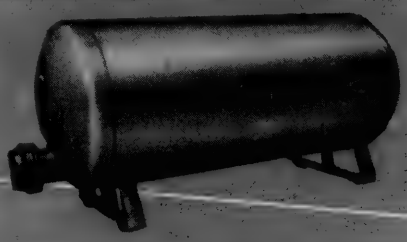
Next time you specify Hot Water Generators, Storage Tanks, Heat Exchangers or special fabricated systems—specify Novelty to break the LQP barrier.

**Specify NOVELTY**
**THERE'S NO EQUAL**

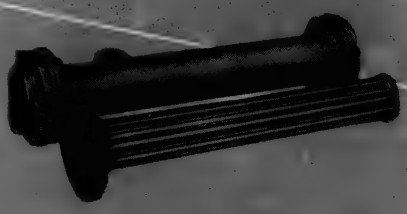
NOVELTY
STEAM BOILER WORKS INC



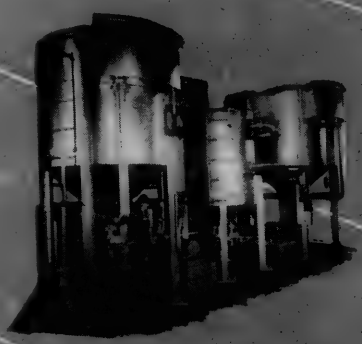
Storage Tanks



Hot Water Generators



Heat Transfer Equipment



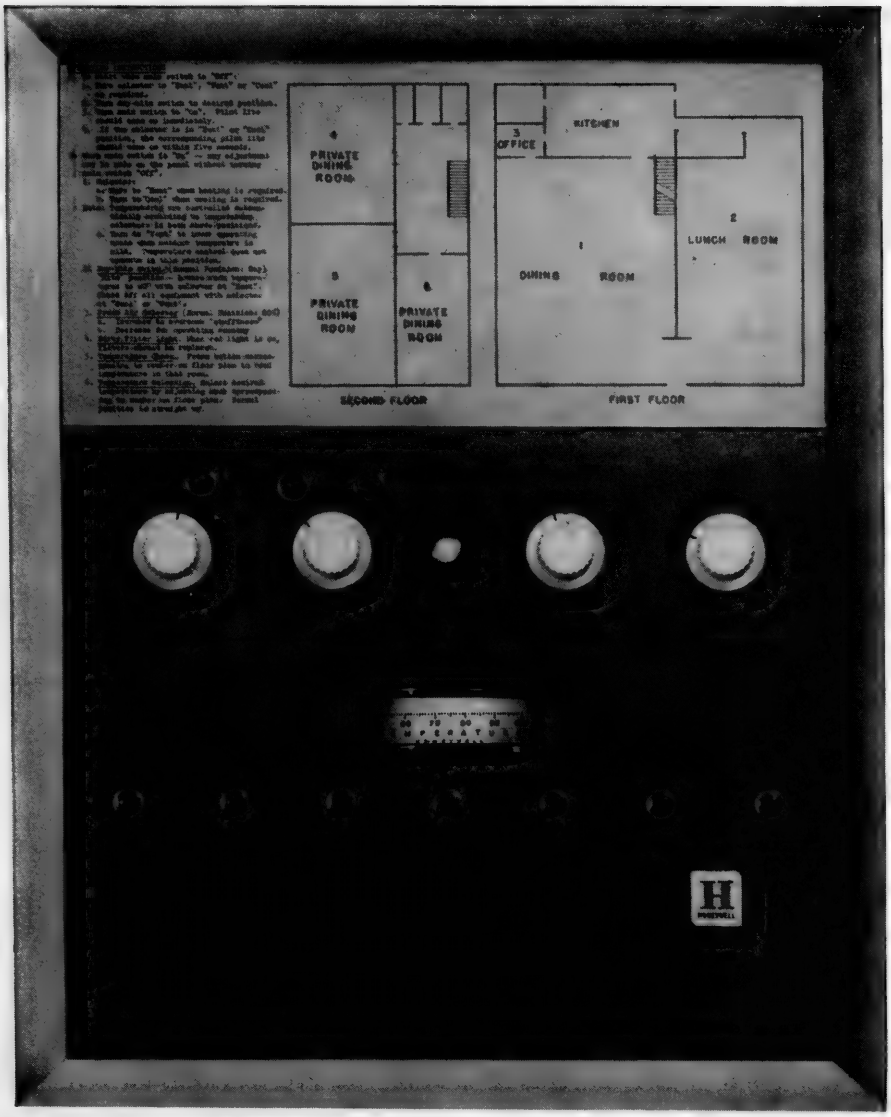
Special Fabrication

NOVELTY STEAM BOILER WORKS, INC.
CLARE AND KLOMAN STREETS • PLAZA 2-0425 • BALTIMORE 30, MARYLAND

Representatives in Major Cities

**NEW . . . for restaurants, stores, offices**

# HONEYWELL CONTROL MASTER*




**Typical panel.** This one is for a restaurant. It could as easily be for any other small commercial building. Note simplicity, self-explanatory features that make it ideal for owner-manager operation. Operating instructions are elementary, floor plan is self-explanatory, controls, buttons, dials and lights are all clearly labeled.

*Control leadership through advanced engineering—research*

# FOR SMALL COMMERCIAL BUILDINGS

*New panel centralizes and simplifies air conditioning operating adjustments so owner or manager can handle with ease*

THE NEW Honeywell panel you see pictured here should be a real boon to your client, the small building owner.

For it gives him, in a panel he can understand and operate himself, complete control over building comfort.

Standing before the Honeywell Control Master he can read temperatures in every part of his building by pushing the proper button. And he can adjust them by turning a dial. The same goes for fresh air damper positioning and basic system adjustments.

If he's ever in doubt, the simple operating instructions and zone diagram are there for him to review.

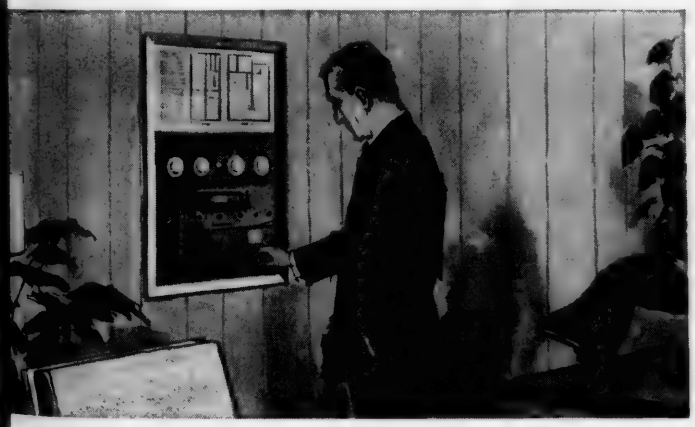
For the first time your client can operate his air conditioning system efficiently and effectively—providing the temperature level he wishes. He no longer has to put up with expensive overcooling on mild days with light occupancy, or uncomfortably warm conditions due to overcrowding. He can anticipate busy and slack hours.

Important to you during the guarantee period and to your client later is the reduction in service calls because of the ease of adjustment and easily understood controls. Also, you won't have to make several trips to explain the system operation and controls.

The Control Master is made possible by the characteristics of Honeywell Electronic Controls with all of their superiority and advantages.

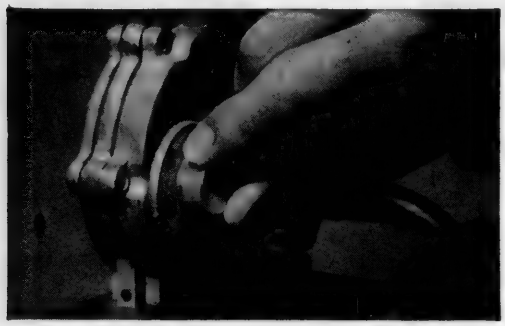
For further information about the Control Master and other Honeywell central control panels, call your local Honeywell office. Or write to Minneapolis-Honeywell, Dept. HV-10-247, Minneapolis 8, Minn.

*Trademark



**Easy access.** All comfort system operating adjustments can be made from single location. Here, the manager has the compact, attractive panel installed in his office where it makes an interesting and decorative addition.

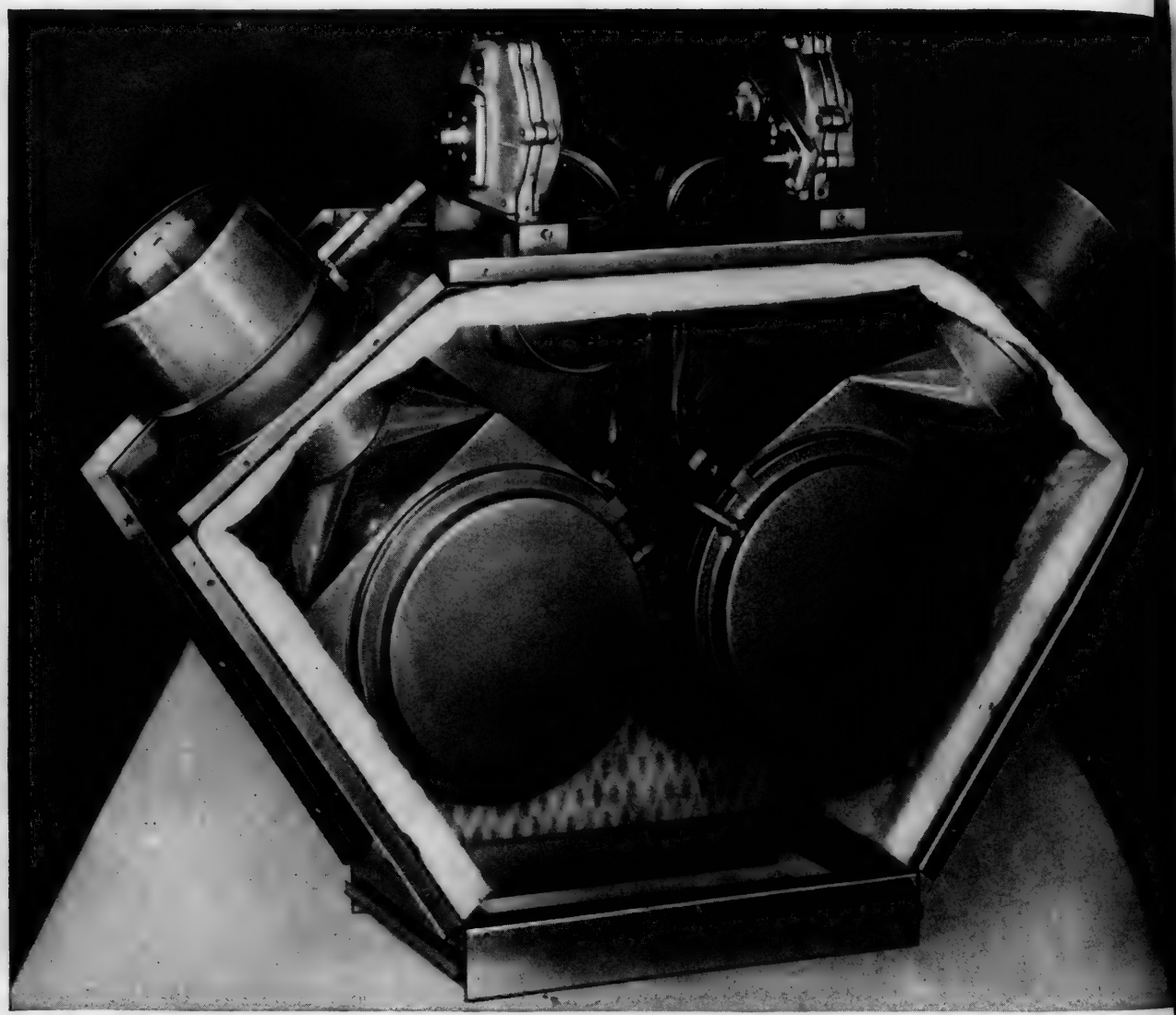
*For news about another major Honeywell contribution to indoor climate, turn the page.* ——→



Calibrated dial air balancing is the key to the superior performance of the Honeywell High Velocity Air Blender. You adjust dial only once, need never recalibrate again. Once balanced, comfort control is in the hands of the system thermostats.

## Dial Air Balancing

# NEW HONEYWELL A HIGH VELOCITY D



**Fits any mixing box.** The configuration you see here is but one of the many possible for ceiling units. Also, it's now available in nearly every under-the-window type unit. From the new Honeywell Blender you can expect controlled volume of air, constant CFM, long valve life and simplified control. The thermostat in the system controls temperature by controlling the volume of hot air passed by the hot duct. At the same time a flow regulator provides a constant hot air volume for a given thermostat signal under variations in supply duct pressures. A constant total flow is provided by a total flow regulator which operates the cold air valve to make up the difference between hot flow and desired total flow.

*Control leadership through advanced engineering—research*

# AIR BLENDER SOLVES DUAL-DUCT DISTRIBUTION PROBLEMS

## *Provides constant delivered air volume, needs no recalibration when you add to system*

WITH THE new Honeywell Air Blender your clients get the level of comfort they want—on the simple call of the room thermostat.

They get this easily, because the Honeywell Air Blender combines temperature and volume control in one unit.

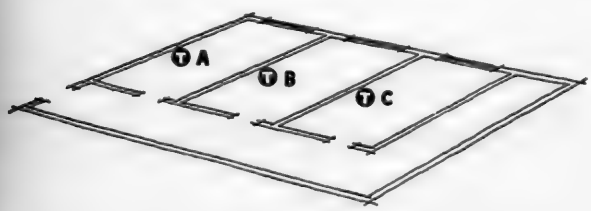
And comfort doesn't come at the expense of some other room. It comes from the system. *One room no longer "robs" another of comfort.*

Besides providing constant delivered air volume, the Honeywell Air Blender takes well to change. With Dial Air Balancing you can add to the system without having to recalibrate distribution points that may be scattered widely—especially valuable in floor by floor modernization or on new construction.

Self-powered, the Honeywell Air Blender uses the pressure of the air it is controlling to actuate the diaphragm—its only moving part. Such simplicity makes possible long life and trouble-free performance.

For further information about the Honeywell High Velocity Air Blender and other Honeywell heating and air conditioning products, call your local Honeywell office. Or write to Minneapolis-Honeywell, Dept. HV-10-247 Minneapolis 8, Minnesota.

*No room "robs" comfort from another*




For the first time in high velocity air handling history you can design a system where adjustment in one room doesn't upset comfort balance in others. Thus, in a typical office, adjustment in area A does not rob comfort from B or C. Neither delivered air volume, nor the ratio of hot to cold air is affected in B or C. This is one of the reasons why it's wise to design with the new Honeywell Air Blender in mind.

The "new" look in thermostats that's appearing on walls of commercial buildings throughout America. New design *inside* gives closer control, vastly superior performance.

*Only Honeywell gives you all four—pneumatic, electric, electronic, instruments.*

**Honeywell**

First in Controls

# Bethcon is strong yet easy to work

It's true: Bethcon galvanized sheets offer a remarkable combination of strength and ductility not to be found in other galvanized sheets. And that, of course, results in smooth shop-work and satisfied customers.

Bethcon sheets owe their superior qualities to Bethlehem's last-word continuous galvanizing lines. These lines include a continuous annealing process which gives the base steel its strong-yet-workable characteristics.

In addition, Bethlehem's continuous galvanizing process applies the zinc coating much more tightly to the steel than the conventional hot-dip method. Thus you can put a Bethcon sheet through the toughest forming processes without danger of cracking or flaking the coating. Even when Bethcon is doubled back on itself, the coating remains intact.

Bethcon sheet is available in 13-ga and lighter, coiled or in cut lengths, with either plain open-hearth or copper-bearing steel (Beth-Cu-Loy) for the base metal. If you desire additional information on Bethcon, you will get prompt attention from the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
*Export Distributor:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

BETHLEHEM STEEL

# HOFFMAN

## THE COMPLETE LINE of VENTING VALVES

**STEAM OR WATER—RADIATORS—CONVECTORS**
**BASEBOARDS—MAINS—UNIT HEATERS—PROCESS WORK**

***Write for Complete Catalog***

**STEAM UNIT HEATER VENT**

**No. 74**

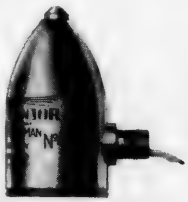
**AIR VALVE**

**No. 500**

**No. 2-A**

**No. 70-A**

**No. 40**



**No. 1000**

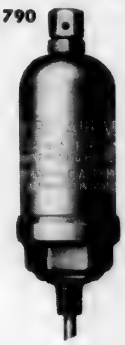
**CONVECTOR STEAM VENTS**

**No. 71-A**

**No. 71-B**

**No. 71-C**

**No. 790**



**No. 791**

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**No. 75-H**

**No. 76**

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**No. 78**

**HOFFMAN SPECIALTY MFG. CORP.**

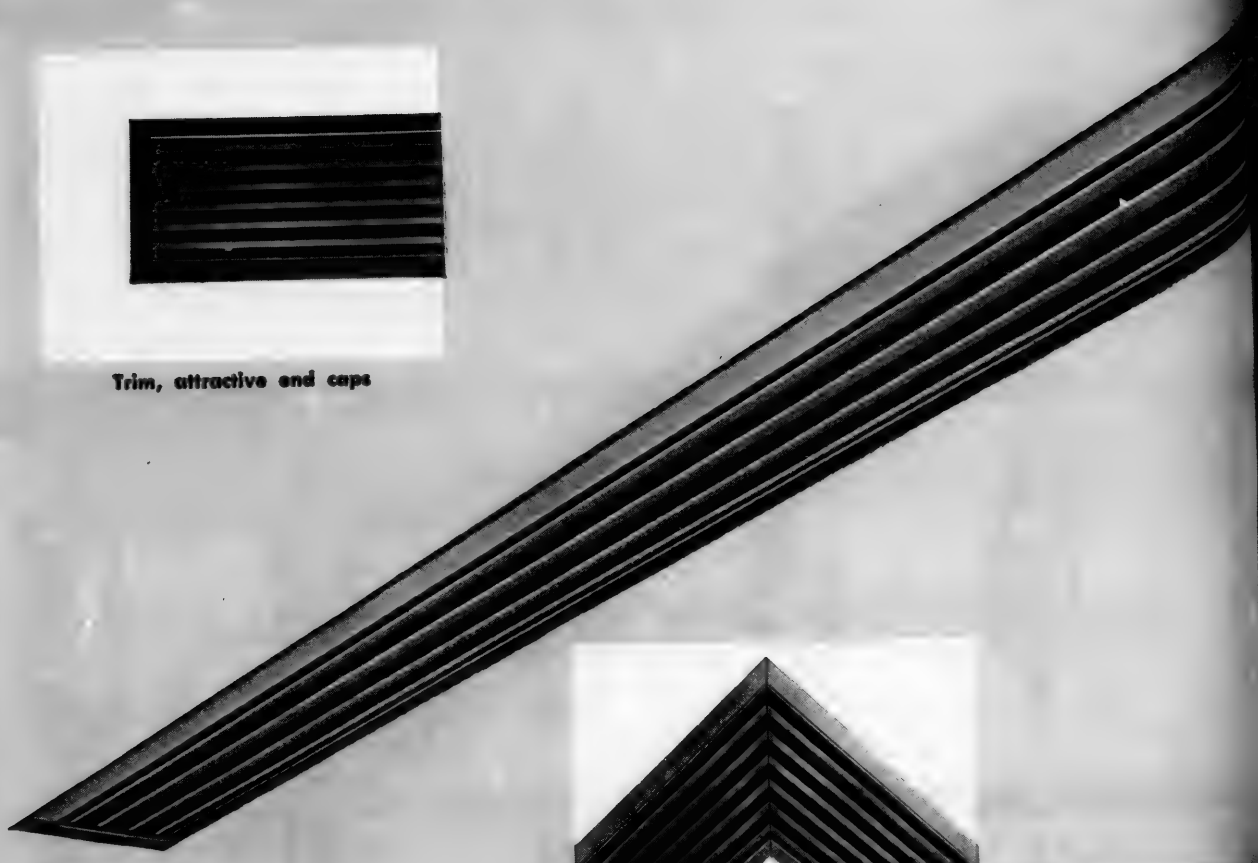
1700 W. 10th Street, Indianapolis 7, Indiana

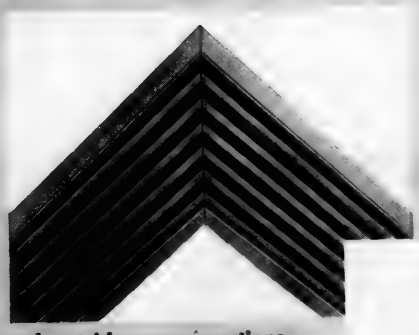
SOLD ONLY THROUGH LEADING WHOLESALERS OF HEATING AND PLUMBING EQUIPMENT

Sections butt without breaks

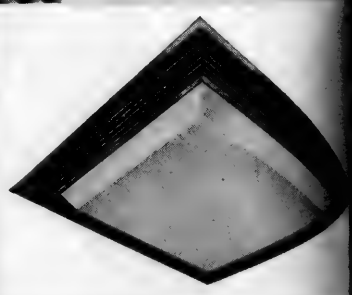


Trim, attractive end caps

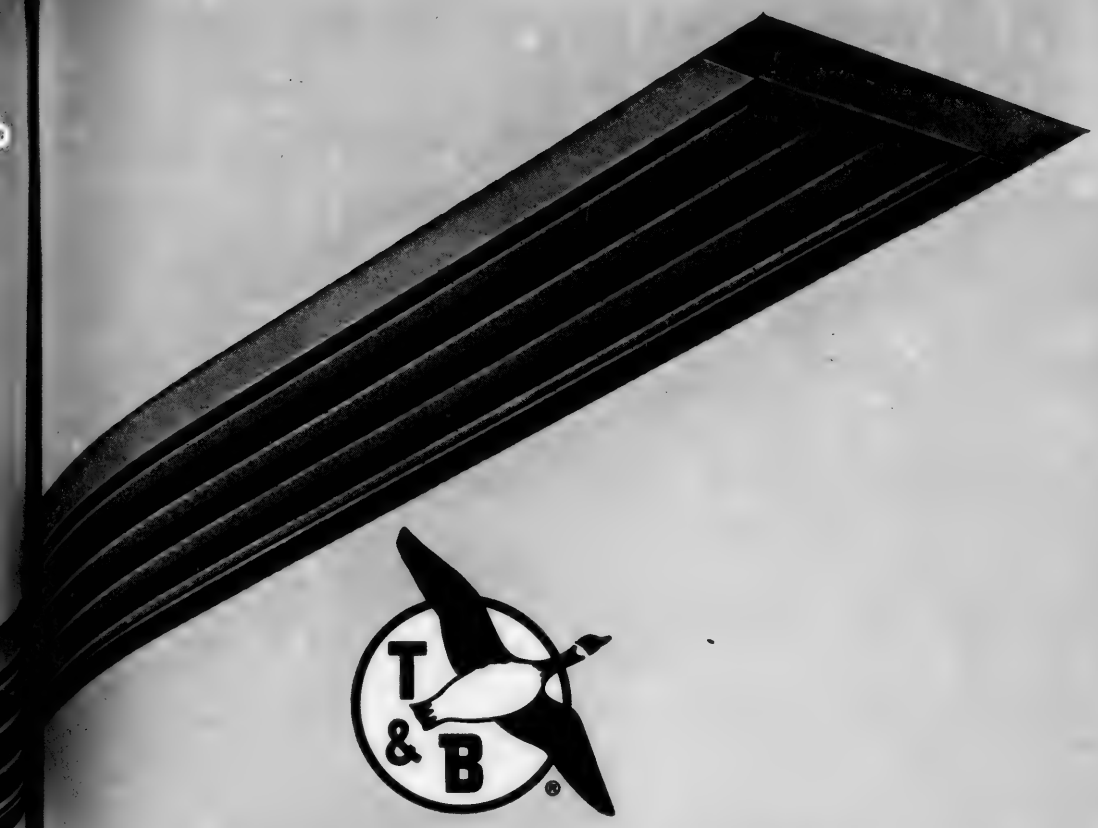




Mitered inside and outside corner sections . . .



. . . ideal for installation with square light fixtures



# LINEAR DIFFUSERS

## reserve the clean-line symmetry of modern architectural design

For installation on ceiling or sidewall, Tuttle & Bailey Linear Diffusers are designed to maintain the functional straightline beauty of modern architectural concepts. Particularly effective when installed in continuous runs, individual sections butt neatly without breaks, and mitered 90° inside and outside corners permit extension of the clean-line symmetry on perimeter applications. A unique yet simplified method of installation eliminates the need for screws in the margin of the diffuser. Units can also be furnished with a recessed plaster frame which means only the unbroken lines of the louvres are visible.

Tuttle & Bailey Linear Diffusers may be installed on either the supply or return portions of the system. They are available as one-way or two-way blow units in 18", 24", 30", 36", 48", 60" and 72" lengths.

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

*Today . . . write for Catalog No. 114.*

# 117 MODINES to fit any heating job

Portion of typical Modine distributor's stock. Write for names of stocking wholesalers nearest you.

## any type, any size, any style

It's easier to meet exact heating requirements when you're selecting unit heaters from the complete Modine line. No matter what the mounting height, temperature or heat-throw demands—Modine has the answer. And buyers are assured of highest quality *because Modine designs and manufactures its own unit heaters.*

● Modine steam and hot water units provide perfect heating comfort at lowest possible fuel costs because the discharge temperatures are correctly related to heat throw and air volume.

● Modine's gas-fired unit heaters last longer, cost less to install. Direct firing of tubes and reduction of heat exchanger mass give you heat within seconds.

For all the facts, see the Modine representative listed in your classified telephone directory. Or you can write directly to Modine Mfg. Co., 1511 DeKoven Avenue, Racine, Wisconsin.

### 102 STEAM OR HOT WATER UNIT HEATERS

Choose from 38 horizontal, 44 vertical and 20 power throw models. Of these, 38 are high corrosion resistant (HCR) models, 48 are low outlet temperature models. Write for a copy of Bulletin 157.

U-1361

### 15 GAS-FIRED UNIT HEATERS

All Modine gas-fired units have stainless steel burners. Eight models also feature *stainless steel* heat exchangers. The other 7 are equipped with *aluminized steel* heat exchangers. For more information on these outstanding units write for Bulletin 657.

AIRditioners | Convectors | Cabinet units | Gas unit heaters | Steam & hot water unit heaters | Duct furnaces

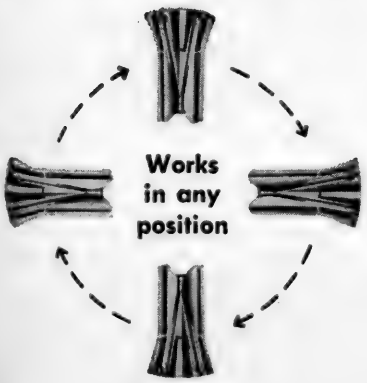
*In Canada:* Sarco, Ltd., Toronto

**Modine**
MANUFACTURING COMPANY

# SIZE THERMO VALVES CLOSER...

## with Alco Venturi-Flo Distributors

## TOTAL PRESSURE DROP WITH 36" OF FEEDER TUBES: 5 PSI AT 25% CAPACITY • 25 PSI AT 150% CAPACITY




### FULL DISTRIBUTOR EFFICIENCY

**No nozzles to install or size.**

One Venturi-Flo replaces distributors requiring up to 6 or 7 nozzles.

Works in any position.

### COMPLETE RANGE OF SIZES

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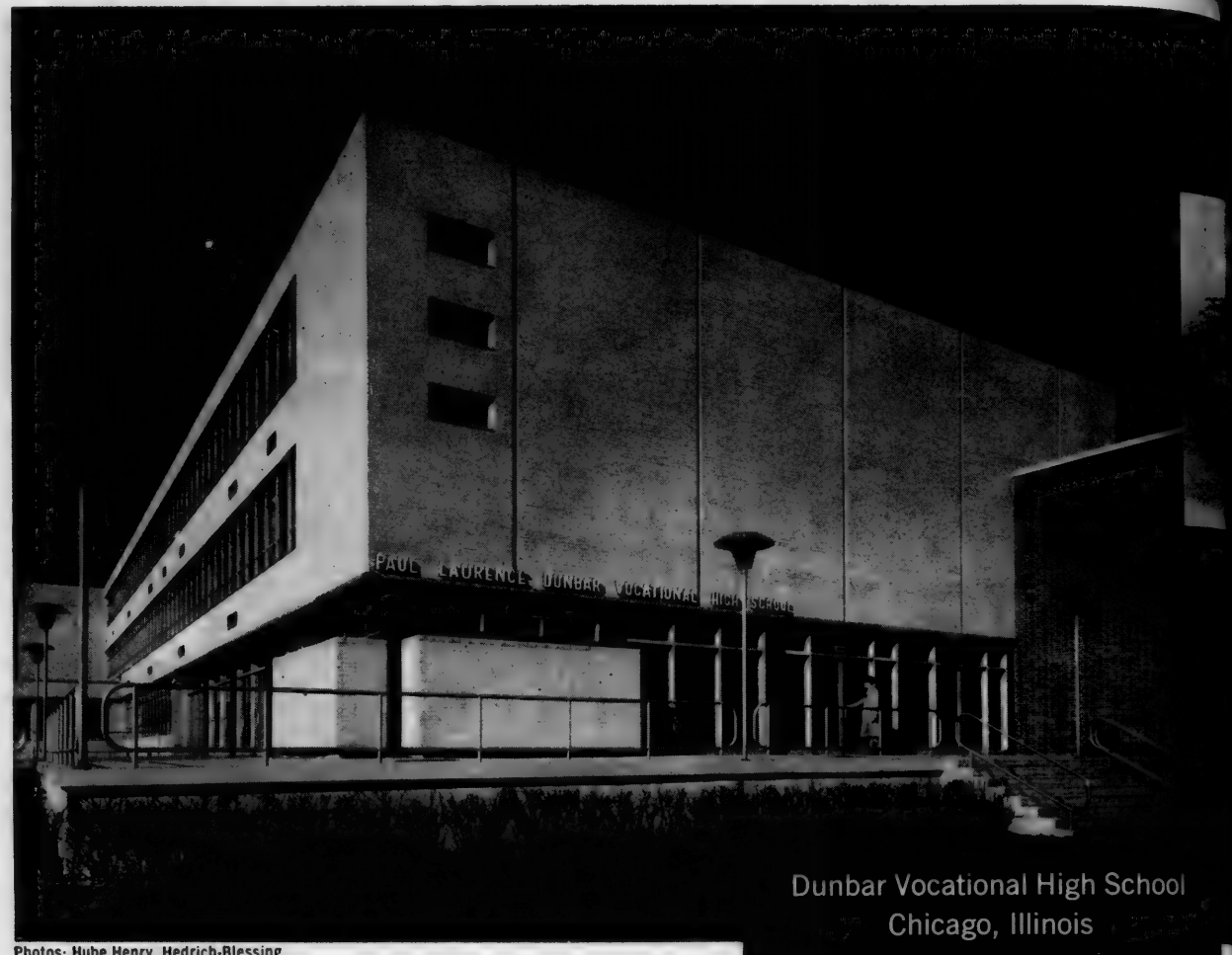
**The one complete line of refrigerant controls that insures product quality:** Thermostatic Expansion Valves, Refrigerant Distributors, Solenoid Valves, Suction Line Regulators, Flooded Evaporator Controls, and Reversing Valves.

7708




Photos: Hube Henry, Hedrich-Blessing

## Dunbar Vocational High School
## Chicago, Illinois

Entrance 3000 South Parkway

**In the World's Largest Industrial Center,** near the sites of Chicago's famous World's Fairs of 1933 and 1893, the $8,000,000 Dunbar School provides an efficient modern plant with the best equipment and instruction obtainable. It is coeducational and accommodates some 2300 day students. Night classes for adults are almost as large.

**Students May Major in One of 27 Courses** ranging from architectural and mechanical drafting, building trades and electronics to cosmetology (beauty culture), millinery and welding. All students are required to complete courses in English, science, mathematics, history and civics . . . the core of the curriculum.

**Diverse Activities In This Outstanding School** require different levels of thermal comfort for optimum efficiency of teachers and students.

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(s34)

**Flexibility of a POWERS pneumatic control system**

→

**provides each room with its proper temperature.**

**Foundry Practice, electric furnace**

**Aircraft Engine Mechanics**

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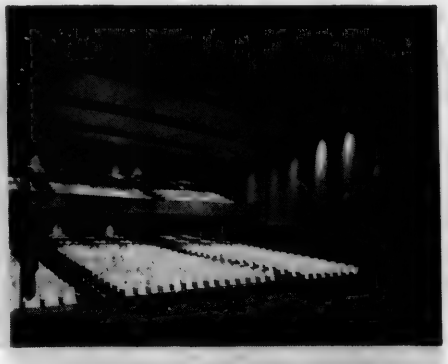
# Chicago's new Dunbar Vocational High School

## ...offers students a bright future in the career of their choice

Another Important School Helping to Build a Greater Chicago



**POWERS**

QUALITY System of
Individual Room
TEMPERATURE CONTROL

Provides Proper Thermal Environment for Learning

**Dunbar is the Largest Chicago Public School** built in the past decade. It consists of three buildings — a one story shop section; a three story classroom section; and a two story wing for auditorium, two gymnasiums, swimming pool and cafeteria. The latter section can be isolated for community use... Classrooms have unit ventilators. Central fan systems supply heating, ventilating and humidified air to auditorium, gymnasiums, natatorium and cafeteria. Eighteen boys shops are heated by unit heaters. These areas are also supplied with tempered fresh air to compensate for the exhaust systems. Interior shops are supplied by central fan systems... all are Powers controlled.

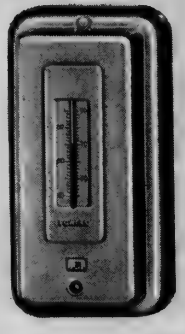
**Are You Planning a New School?** — Ask your architect or engineer to include a Powers engineered QUALITY system of pneumatic control. You'll insure utmost comfort at lowest upkeep cost.

*For further information contact our nearest office*

**THE POWERS REGULATOR COMPANY**

SKOKIE, ILL. | *Offices in Chief Cities in U.S.A., Canada and Mexico*

65 YEARS OF AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL



**Powers Pneumatic Thermostats** maintain set temperature day after day. They need no frequent checking or re-adjusting.

**Powers PACKLESS Valves** prevent water leakage, banish packing maintenance and give better control due to reduced valve stem friction.

Office Practice Classroom

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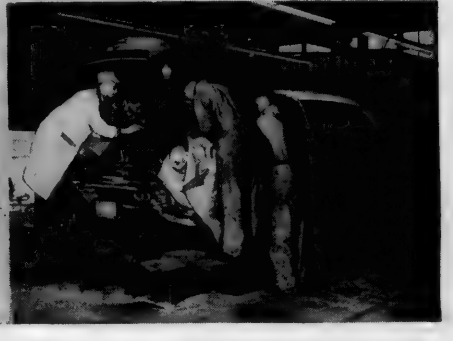
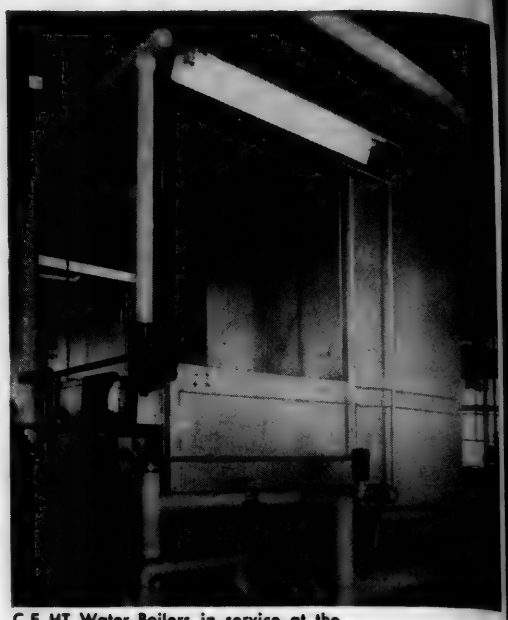


*The Cross Company specifies . . .*

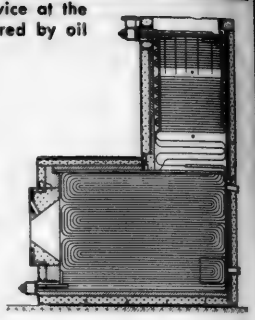
# High temperature water by C-E for heating economy ...low maintenance

The Cross Company, pioneer producer of automation machinery, has recently completed an ultra-modern plant in Fraser, Michigan — practically doubling its former production capacity. After a thorough study of heating requirements . . . and with a view toward further expansion . . . two C-E LaMont Controlled Circulation Hot Water Boilers were specified for the new plant. According to Mr. W. P. Reece, Plant Engineer, "the study indicated that this system would provide the lowest fuel and maintenance costs . . . Experience during this winter confirms the soundness of our decision."

If you are in the market for a heating or process system, it will pay you, too, to investigate high temperature water. Individual needs vary, of course, and both hot water and steam boilers have their place. Our engineers will be pleased to discuss the subject with you or your consultants. Write for our catalog HCC-2.



C E HT Water Boilers in service at the Cross Company. They are fired by oil or natural gas.



Right — One of the 12 million Btu/hr Cross Company boilers. C-E HT Water Boilers are available in sizes from 10- to 300-million Btu per hour; pressures to 500 psi and temperatures to 470F.

Architect's drawing of the new Cross Company plant, Giffels and Vallet, Detroit, Consulting Engineers; Owen S. Lieberg, Associated Consultant.

**THESE ARE THE GENERAL ADVANTAGES OF HIGH TEMPERATURE WATER:**

1. Higher available heat — many times that of steam at the same pressure.
2. Closer control of temperature.
3. Lower heat loss . . . unused heat returns to the boiler . . . no condensate return lines.
4. No elaborate feedwater treatment . . . make-up requirements are exceptionally low.
5. Steam traps not required . . . trap problems and expense are eliminated.
6. No blowdown losses . . . no safety valve vent losses . . . no condensate losses.

**THESE ARE THE SPECIFIC ADVANTAGES OF THE C-E "HT" WATER BOILER:**

1. Complete control over circulation in both system and boiler.
2. No separate boiler pump is required, since low pressure loss is inherent.
3. Pressurized operation with oil or gas means no induced draft fan.
4. Single-pass design — no baffles — means cleaner boiler and lower draft loss.
5. Controlled, positive circulation permits more efficient arrangement of heating surfaces.
6. Any fuel — oil, gas, coal, or any combination of fuels.
7. Gastight, welded, steel casing.
8. Fewer headers, all of which are easily accessible.

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ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

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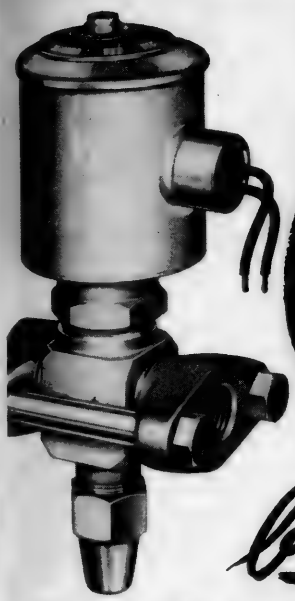
## PEAK PERFORMANCE SOLENOID VALVES



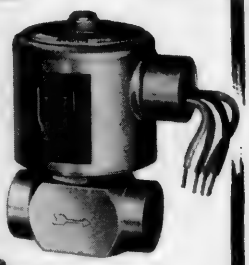
*with the*

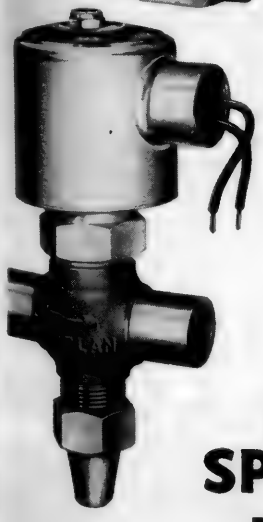
# POWER PACKED BLUE SEAL COIL!

*because* . . . it is layer wound with a cross woven insulating layer of cotton thread between each layer of magnet wire, thereby minimizing coil burn out.

***After Winding*** . . . it is twice dipped in high temperature insulating and moisture repellent varnish and baked after each coating.

Its final Blue Seal protective coat and bake assures a perfect moisture proof seal.





***Plus all these additional SPORLAN engineering features . . .***

Simplicity . . . few parts . . . sturdy take apart construction . . . floating type stem and plunger assembly . . . tight closing . . . internal parts precision machined. All large capacity pilot piston operated solenoid valves are equally applicable to Refrigerants 12, 22, and Carrene-7. Synthetic seating originally introduced by SPORLAN in 1947 has now been incorporated in the design of all pilot piston solenoid valves and in some direct connected models. 3 size Blue Seal Coils fit the complete line of SPORLAN Solenoid Valves thereby affording greater interchangeability of coils. Large capacity sweat type connection valves are assembled hand tight . . . saves valuable time in removing internal parts before installing valves in the system. A universal mounting bracket fits all valves.

***and Remember . . .*** *for Peak Performance on all installations*
*Buy SPORLAN Right Down the Line . . . Catch-Alls . . . Solenoid Valves . . . Thermostatic Expansion Valves . . . and Refrigerant Distributors.*

**SPORLAN VALVE COMPANY**

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*SMOKE TEST* shows one of the many heating patterns possible with TRANE Projection Unit Heaters. More freedom of location — patented Louver Cone Diffuser steers heat in any direction. Heat patterns are easily changed for future needs without moving unit.

# How to put the heat where you want it

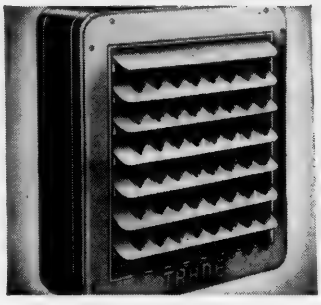
## *Exclusive Trane diffusion features give you freedom of design . . . freedom of location*

You can solve factory and commercial heating problems more easily with these TRANE Unit Heaters. That's because the exclusive TRANE diffusion features allow you to locate equipment where you please—and direct the heat where it's needed. Heat patterns are easy to change to meet future needs, too. A simple adjustment of the heat flow can save costly relocation of equipment.

And the TRANE heating lines are so *complete*, you can specify equipment that is *just right* for the job—whether it's spot heating, space heating or a complete central system. TRANE brings you *matched* equipment—designed, engineered and built together, to *work* together.

Next time you're planning heating for any commercial or industrial application, make it TRANE! Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

**PROJECTION HEATERS** are vertical discharge units that project heat from ceiling to the floor line. 18 standard and high cfm models for steam or hot water. Exclusive TRANE Louver Cone Diffuser directs air stream in any desired pattern—gives one unit the versatility of many.




**HORIZONTAL HEATERS** feature famous TRANE Coils and a specially designed broad blade unit heater fan. Used for horizontal discharge, space and spot heating. Patented Louver Fin Diffusers direct air stream in an unlimited number of diffusion patterns. Gas-fired models available.

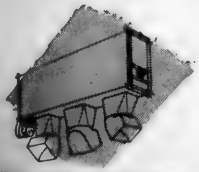
*For <u>any</u> air condition, turn to*

# TRANE

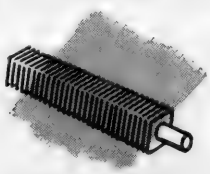
**MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT**

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 19 CANADIAN OFFICES

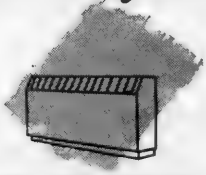
*Turn to Trane for every heating need . . .*



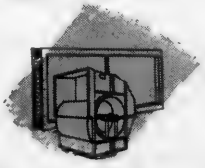
**HEAT AND VENTILATE** large areas with a TRANE Terrivent. Rugged, efficient centrifugal unit that handles up to 33,000 cfm.



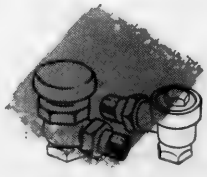
**UNDER WINDOWS** and skylights, TRANE Wall-Fin gives low-cost draft protection. May be tiered for extra capacity.



**TRIM, NEW WALL-FIN** in cabinets for cafeterias, office, administration areas gives you custom styling with production models!



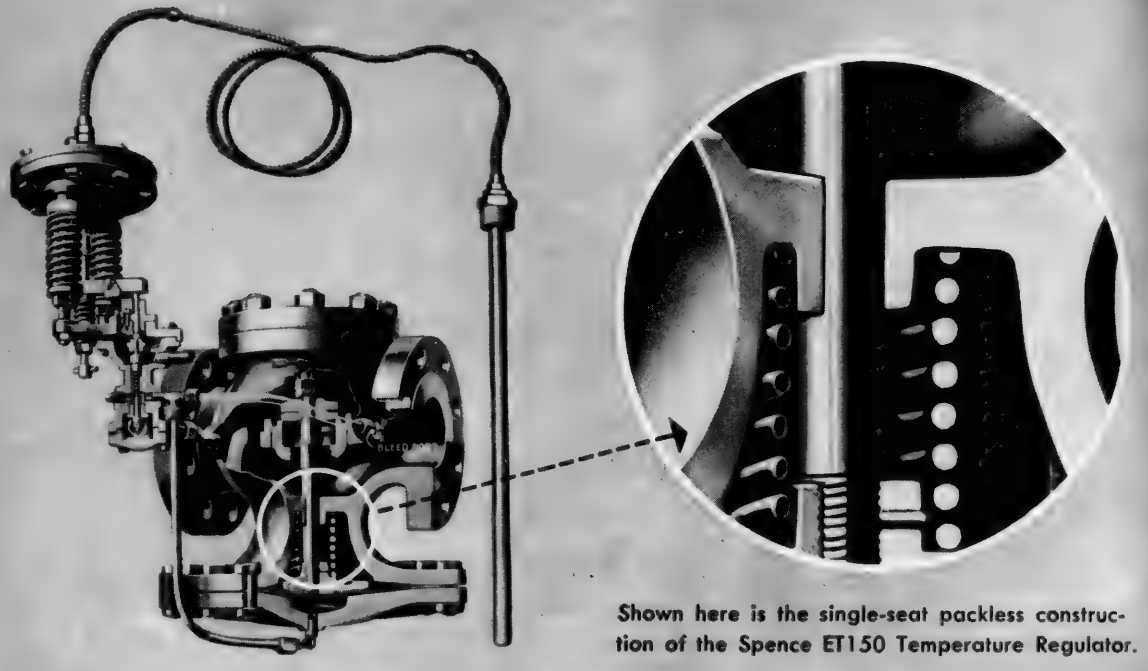
**FOR "BUILT-UP" SYSTEMS,** TRANE Fans and Coils are "matched"—built together to work together. Wide range of capacities.



**SAVE FUEL** with the new, redesigned line of TRANE Steam Specialties. Traps, strainers, valves, vents for any type of system.

**VALVE TIPS:**

# *Advantages of Packless Construction in Temperature Regulating Valves*



Shown here is the single-seat packless construction of the Spence ET150 Temperature Regulator.

One of the biggest headaches in regulating valve maintenance is repacking stuffing boxes.

How often a valve needs repacking, how much time it takes, and the cost of the system downtime all vary with the construction of the regulator and the service it's used for. No matter how you calculate all these variables it's still a headache—and an expensive one.

In the temperature regulator shown above (Spence Type ET150) stuffing boxes are eliminated. This is done by what is known as "balanced" diaphragm construction. You can see in the cutaway drawing that pressure is applied to both sides of the large metal diaphragm. The upper side is exposed to delivery steam pressure and the lower side is exposed to loading pressure applied by the pilot. When the pilot closes, both delivery pressure and loading pressure are equalized through the bleedport and connecting tubing.

This construction not only does away with repacking problems, but it makes possible additional savings as well. For example, you will note in the sectional blow-up that this design eliminates a closely fitted stem and guide. Dirt or other foreign matter doesn't have much of a chance to lodge between these parts and cause sticking.

Another cause of binding or sticking, uneven expansion of closely fitted parts, is also eliminated with this design. In addition, valve stem wear is reduced for the same reason.

Lower maintenance is not the only advantage of this packless construction. Accuracy of regulation is also improved because friction due to a stuffing box, dirt, or uneven expansion is not a problem. The large, *balanced* metal diaphragm is more sensitive to slight changes in pressure.

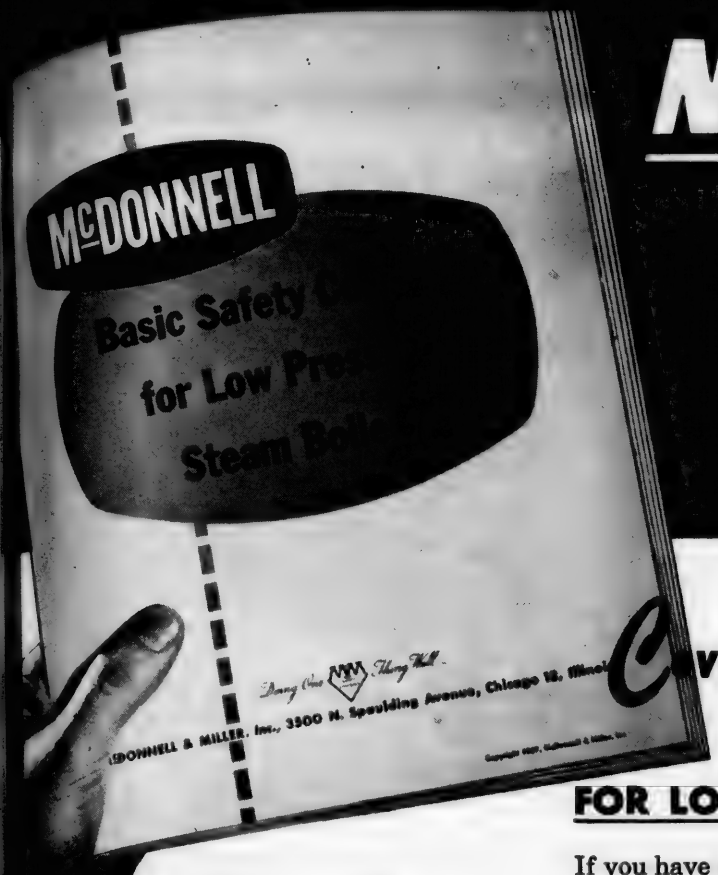
## Guaranteed Not To Wiredraw

If seats and discs are cut by steam (wiredrawn) the loss of steam through these grooves can be another expensive item — directly charged against the regulating valve. Fortunately, you can eliminate these costly leaks by specifying a temperature regulator that is *guaranteed not to wiredraw.*

Spence makes such a guarantee because their seats and discs are made of SECO Metal. Over 20 years experience with this special alloy has failed to produce a single case where a SECO Metal seat or disc had been cut by steam. All that's required is an approved strainer located ahead of the regulating valve. Expensive steam leaks just can't happen with this combination of SECO Metal and single-seat design.

If you would like to have more information on Spence Temperature Regulators, drop us a line and ask for Bulletin T150. It gives more detailed information on these and other Spence design features. Piping layouts and helpful information on the installation of temperature regulators are also included. Write for your copy today.

**SPENCE ENGINEERING COMPANY, INC.**
*Walden, New York*




# NEW BOOK

## That can do a job for you!

### Covers the WHY and HOW of

### BASIC SAFETY CONTROLS

### FOR LOW PRESSURE STEAM BOILERS

If you have one of our recent booklets on Safety Controls for Hot Water Boilers, we know you will want this companion to it covering the low pressure steam boilers. It is the answer to the many requests for "a steam book just like the hot water book."

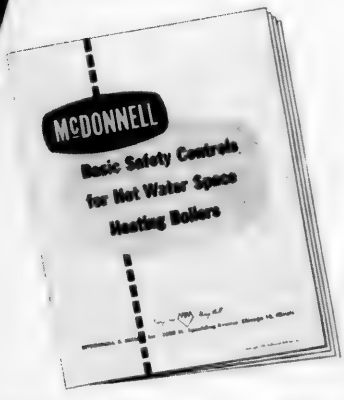
Like its well received predecessor, it deals in brass tacks solely. It tells its story in simple diagrams and equally simple explanation that wastes no words on product description. It sticks to fundamentals and concrete recommendations that answer practically all safety control problems encountered in the low pressure steam boiler field . . . your broadest field.

So well classified and indexed are the facts that whenever a job comes up—however tricky—you can turn right to the most authentic way of handling it: The right product . . . the correct hook-up . . . the proper wiring.

Use the coupon to request your copy, and if by any chance you do not have the earlier "hot water" booklet, request it too.

**McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.**

*Doing One Thing Well*




"Basic Safety Controls for Low Pressure *Steam Boilers*" was inspired by the widely praised booklet, "Basic Safety Controls for *Hot Water Boilers*," illustrated above. If you do not have a copy of the "Hot Water" booklet request it along with the "Steam" booklet. These two companion-pieces can do a real job for you.

*Yours for the Asking* ➧

Send me your new STEAM Book Bul. L-711 ☐

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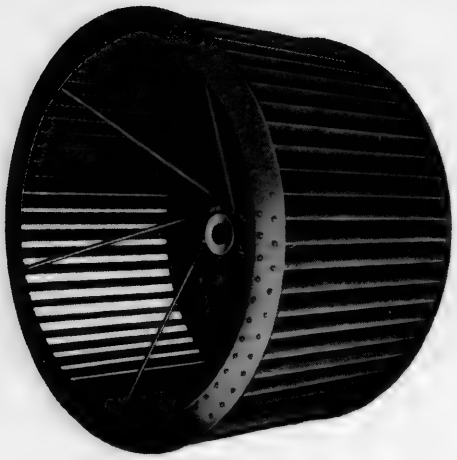
# McDONNELL

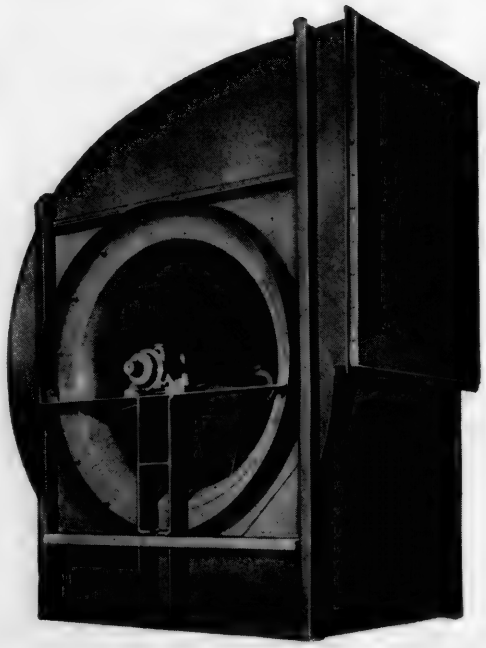
Boiler Water Level Controls



**The Sirocco Wheel**—Designed with a multiple number of narrow, curved blades, forward pitched. Operating at low rotative and peripheral speeds, it delivers more air per revolution than any other type of fan.

**The HS Wheel**—Medium-speed wheel with true non-overloading power characteristic; features large-area die-formed blades, mounted in backwardly inclined position between heavy-duty backplate and streamline rim.

# Match the wheel to the job . . . with rugged, quiet American Blower Sirocco and HS Fans!



American Blower fans have Certified Ratings for dependable performance.

American Blower's complete line of fans lets you match the wheel to the duty, whether it's ventilating, air conditioning, heating; or drying, fume-removal, and processing systems. Their heavy-duty design and construction assure you of long fan life with a minimum of maintenance. Take the Sirocco and HS fans, for example:

Sirocco and HS fans offer smooth, quiet air delivery, high operating efficiency and dependable service. They are available in 25 standard sizes from 12¼" to 132" wheel diameters for volumes to over 700,000 CFM.

Precision-built Sirocco and HS fans can be specified in single or double inlet and in any of eight standard discharges, with ball, roller or sleeve bearings as required. Inlet vanes, dampers or Gyrol Fluid Drive can be furnished to meet volume control requirements. Larger sizes are designed so that they can be dismantled for easy handling in shipment, erection and maintenance.

Get details on the complete line of American Blower fans. Call our nearest branch office; or write direct to American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

**AMERICAN BLOWER**

Division of **AMERICAN-Standard**

# In Aluminum too...

## ...a three-way saving in your piping dollars

When you specify TUBE-TURN* products, you are sure of getting the exact fittings for your job because the Tube Turns' line is the world's most complete . . . *you save engineering time.* Your welders can work faster because fittings are completely identified and perfectly uniform . . . *you save construction time.* You can buy all your fittings with one order from your nearby Tube Turns' Distributor . . . *you save purchasing time.* Are *you* getting these savings in piping costs?

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*The Leading Manufacturer of Welding Fittings and Flanges*

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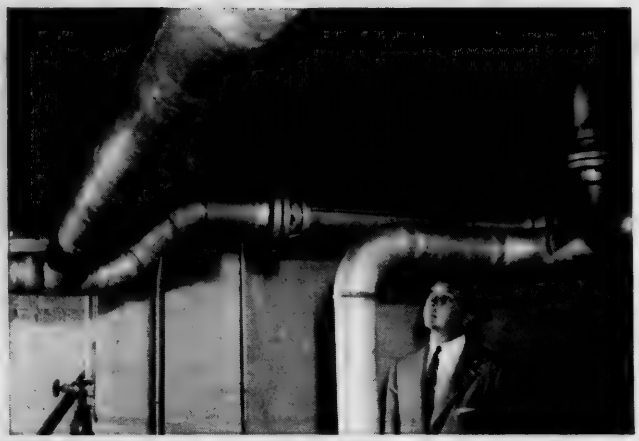
Installation of aluminum [illegible] handling ammonium [illegible]

**OTHER APPLICATIONS SHOWN ON REVERSE SIDE** ▶

# In Aluminum piping too...

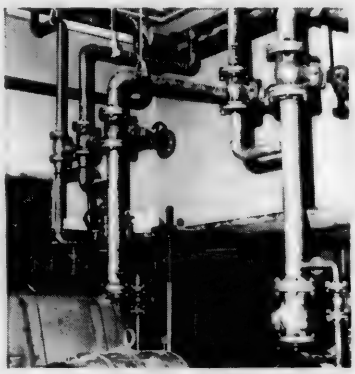
## You save manhours with the line of 12,000 TUBE-TURN products



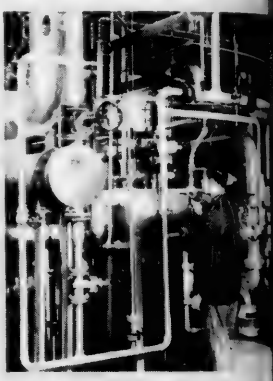
**LIQUID SUGAR.** Part of welded aluminum piping system for processing of liquid sugar. When you specify TUBE-TURN* products, you can count on getting the right type, size, schedule and material for every piping service. Saves engineering manhours.

**"A-POWER."** These TUBE-TURN Aluminum Elbows are for nuclear swimming pool reactor water-coolant lines. Tube Turns' experienced engineering service helps you solve piping problems of all kinds. Contact your nearby Tube Turns' Distributor or District Office.

**OLEIC ACID.** These welded aluminum lines for oleic acid storage show how this strong but lightweight construction can be utilized for corrosive service. Your nearby Tube Turns' Distributor can give you complete-line service promptly . . . to help you save purchasing time.



**REFINERY CATALYST** is handled by this aluminum piping, equipped with TUBE-TURN welding fittings and flanges. Uniformity of TUBE-TURN products saves construction manhours



**PURE WATER.** Passive aluminum piping guards against contamination in this water purification plant. You can buy *all* your fittings with *one* order when you specify TUBE-TURN products.

**TUBE TURNS, Dept. B-7**
224 East Broadway, Louisville 1, Kentucky

Please send free copy of new catalog on Aluminum Fittings and Flanges.

*Company Name*_____

*Company Address*_____

*City*_____ *Zone*___ *State*_____

*Your Name*_____

*Position*_____

Available from your nearby TUBE TURNS' Distributor

*"TUBE-TURN" and "TT" Reg. U. S. Pat. Off.

# TUBE TURNS

**LOUISVILLE 1, KENTUCKY**

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland • Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle. IN CANADA: Tube Turns of Canada Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta • Montreal, Quebec.

# DIAPHRAGM OPERATED!

B&G Safety Relief Valves feature diaphragm construction because *during an emergency*, a B&G diaphragm operated valve has *much greater opening power* than the "pop" type valve. That's because the effective operating area in B&G diaphragm type valves is *as much as nine times greater!*

This added power enables the valve to overcome the effects of fouling which can occur in any heating system. Foreign materials, such as pipe dope, soldering flux and boiler compounds will sometimes cause adhesion of the disc and seat of any relief valve, requiring additional force to open the valve.

Under *normal* operating conditions, the spring force in both types of valves balances the effective areas. During an *emergency*, the extra area of the diaphragm provides extra power which will open the valve within safe operating pressures.

If, for example, the cementing action of adhesive matter in the system water makes necessary an additional two pounds of force to open the valve, a No. 350 B&G Relief Valve *will open at 31.1 psi*, whereas a "pop" type valve will not open until boiler pressure reaches 40 psi.

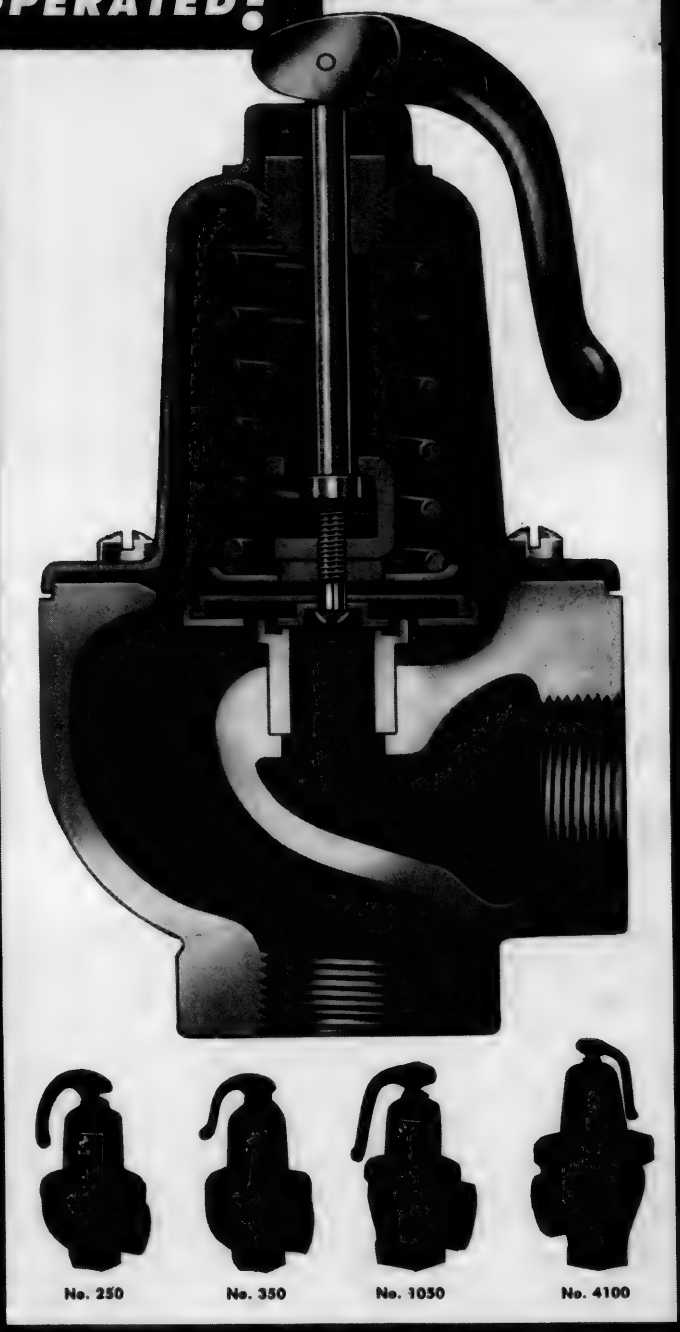
**No guides to jam!**

In non-diaphragm valves, the disc must be centered over the seat by sliding through close fitting guides. Adhesive materials in the system water may cause cementing between the disc and guide sufficient to prevent the valve from opening at safe operating pressures.

There are no guides to jam in a B&G Relief Valve! The disc is always centered in sealing position by the diaphragm.

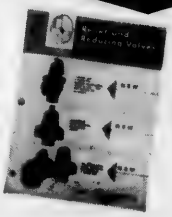
**Silicone Rubber seat**

Silicone is extremely resistant to the effects of high temperatures—will not deteriorate or become deformed through age or use.




**WIDE RANGE OF CAPACITIES**

B&G ASME Safety Relief Valves are available in capacities from 150,000 to 6,050,000 BTU/hr, with valve settings from 15 to 125 lbs. For complete information send for Bulletin HZ-856.

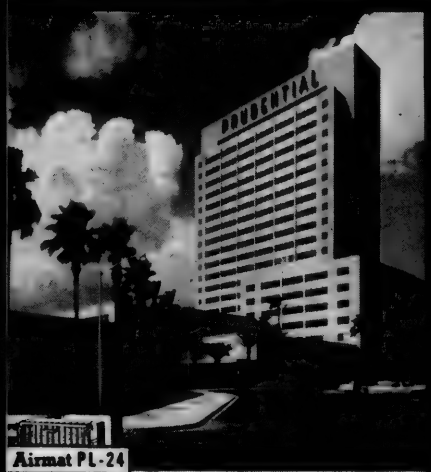


**BELL & GOSSETT**
**COMPANY**
Dept. EZ-[illegible] Morton [illegible]

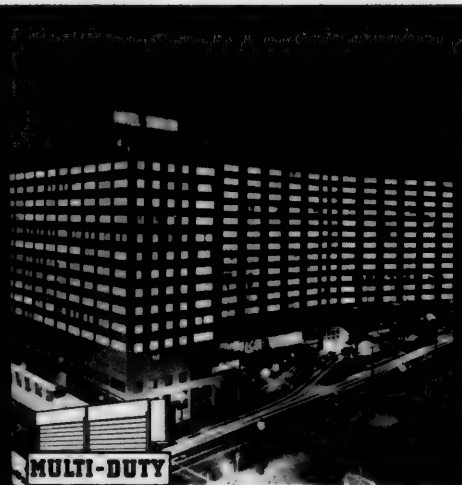
*Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario*

**TENNESSEE**
RICH'S DEPARTMENT STORE, Knoxville. AAF's Electro-PL —the only filter combining dry filtration with electronic action — does the air cleaning job here. Maintenance? Periodic replacement of inexpensive Airmat paper media. Architect: Stevens & Wilkerson; Engineer: Edward E. Ashley.

# Clean Air by AAF.

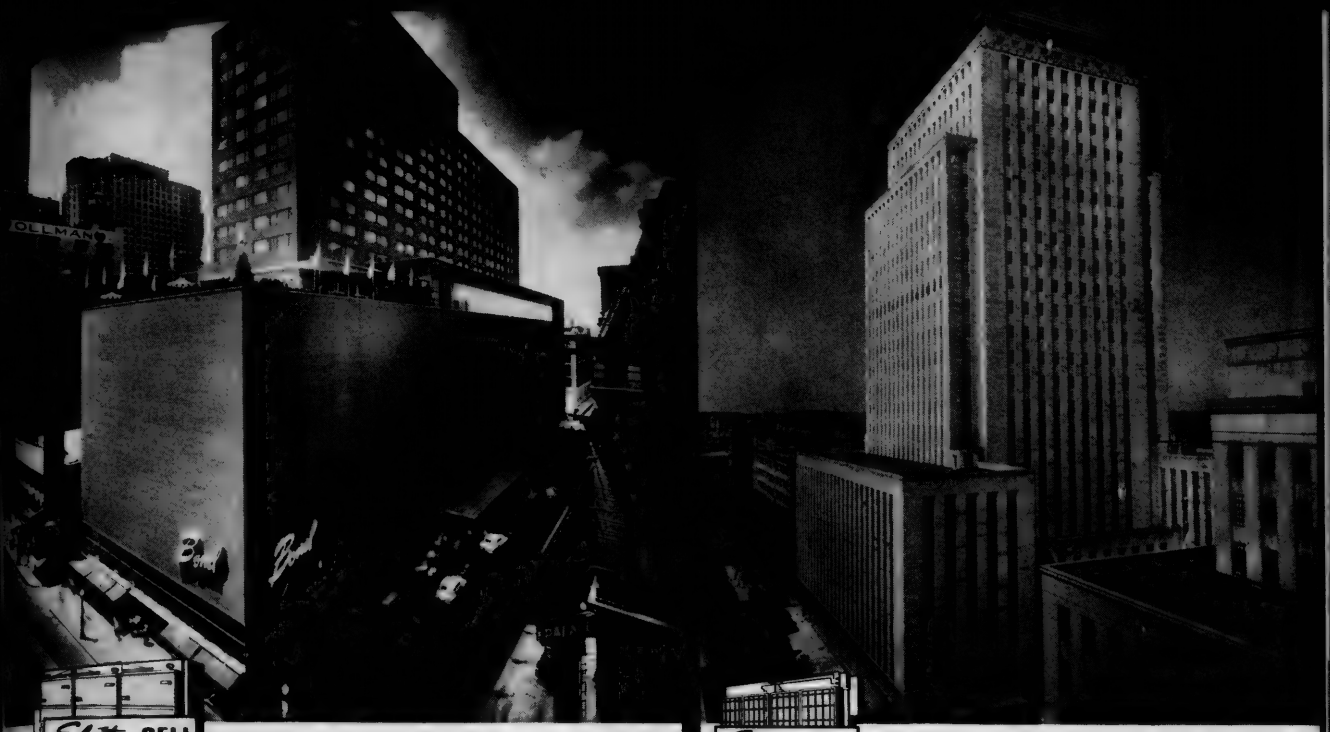


**FLORIDA**
PRUDENTIAL INSURANCE BUILDING, Jacksonville. AAF's Airmat PL-24 is on duty here. Periodic replacement of Airmat paper media takes care of maintenance duties. Architect: Kemp, Bunch & Jackson; Engineer: Edward Van Wagnen.




**CALIFORNIA**
HOTEL STATLER, Los Angeles. The self-cleaning Multi-Duty viscous filter is on the job here. Maintenance amounts to periodic removal of sludge. Architects, Engineers & Consultants: Holabird & Root & Burgee & Associates.

**MINNESOTA**
LUTHERAN BROTHERHOOD BUILDING, Minneapolis. Clean air here is by AAF's renewable-media Roll-O-Matic. Maintenance involves merely replacing dirt-laden media roll with a new one. Architect: Perkins & Will; Engineer: E. R. Gritschke.




Electro-CELL

**OHIO**
TERRACE PLAZA HOTEL, Cincinnati. Maximum cleaning efficiency with push-button maintenance . . . that's the air cleaning job being done by AAF's Electro-Cell precipitator. Architect: Skidmore, Owings & Merrill; Engineer: Jaros, Baum & Bolles.

Electro-MATIC

**MASSACHUSETTS**
JOHN HANCOCK MUTUAL BUILDING, Boston. Super-clean air with minimum care was the order here, and AAF'S completely automatic electrostatic precipitator—the Electro-Matic—fills the bill. Architect: Cram and Ferguson; Engineer: Buerkel & Co., Inc.

# . . . COAST to COAST

The buildings pictured on these two pages are thousands of miles apart—both geographically and architecturally. They differ, too, in their selection of air filters. But they do have *this* in common: *all filters are AAF filters!*

Instead of selling merely one or two kinds of filters, AAF sells *clean air,* and manufactures more than a dozen different types of filters to achieve it. From the complete AAF line, you can select the filter that gives you the *efficiency you need* plus the *maintenance characteristics you want!*

AAF—and *only* AAF—can recommend the one *right* filter for your specific requirements without compromise. Call your local AAF representative or write direct for further information.

AAF Dust Control Equipment

Illinois Heating Specialties

**BETTER AIR IS OUR BUSINESS**

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

AAF
herman nelson

**American Air Filter**
COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

## THEY CHANGE THEIR OWN FILTERS–AUTOMATICALLY

HERMAN NELSON

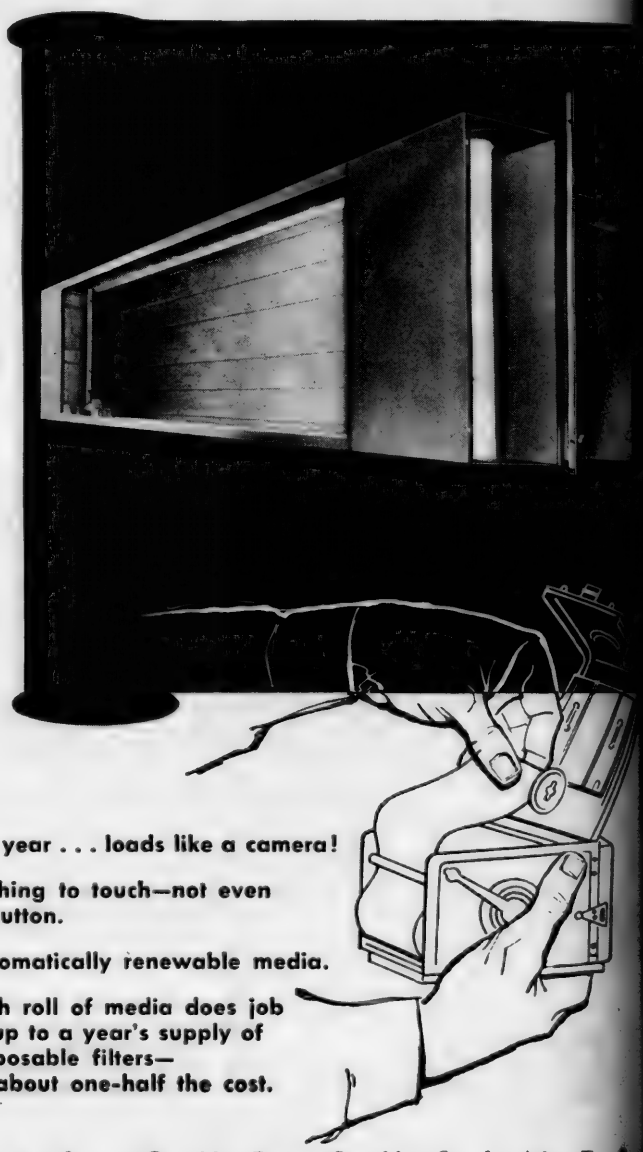
# ROLL O VENT

AIR HANDLING UNITS

NEW, COMPLETELY AUTOMATIC IN OPERATION, the exclusive AAF Roll-O-Matic Air Filter Principle is now available on three leading Herman Nelson ROLL-O-VENT air handling units. You simply put the roll of media in the unit—*and forget it*—for up to a year! Operation is completely automatic, and under normal conditions costs just half that of ordinary disposable filters.

You gain maximum filtering efficiency *all year 'round*—with little or no maintenance. There is no reduction of efficiency in the system due to clogged filters. Furthermore, the system is always in balance —air flow *constant*—because clean media is automatically changed at just the right time!

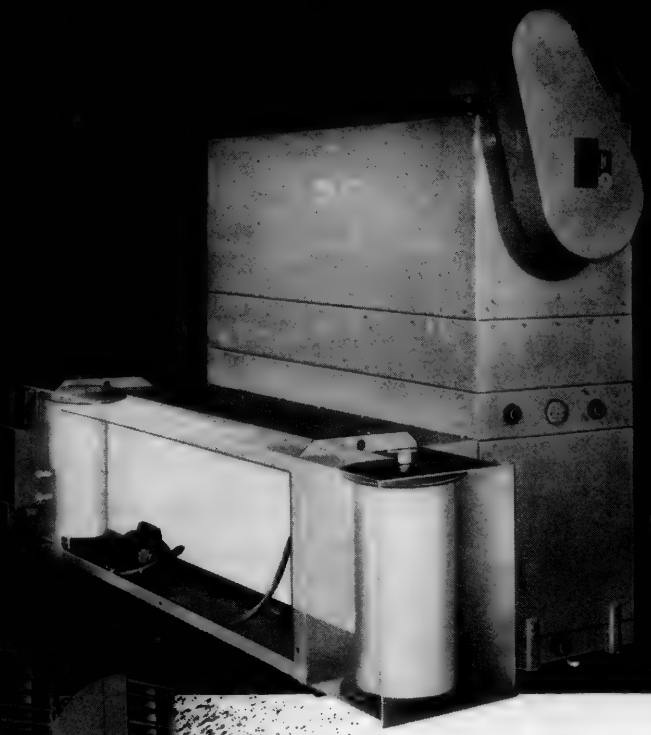
Take advantage of the important time and cost-saving features provided by this exclusive AAF development. Write for full details on "packaged" Herman Nelson ROLL-O-VENT heating, ventilating and cooling units. Ask for fact-filled Bulletin 780. Address Dept. 294.



**One roll of media lasts up to a year . . . loads like a camera!**

- **Nothing to touch—not even a button.**
- **Automatically renewable media.**
- **Each roll of media does job of up to a year's supply of disposable filters— at about one-half the cost.**

BETTER AIR IS OUR BUSINESS



Herman Nelson
Roll-O-Vent
Air Conditioning Unit — *IT CHANGES ITS OWN FILTER — AUTOMATICALLY*

Herman Nelson
Roll-O-Vent
Industrial Unit Heater — *IT CHANGES ITS OWN FILTER — AUTOMATICALLY*

Herman Nelson
Roll-O-Vent
Heating And Ventilating Unit — *IT CHANGES ITS OWN FILTER — AUTOMATICALLY*

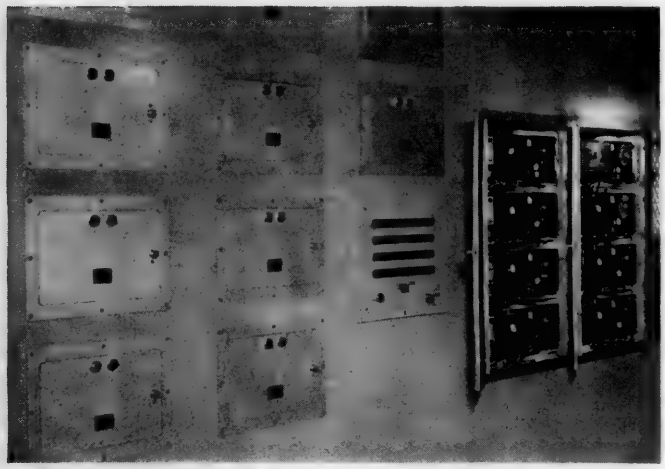
AAF
herman nelson

# American Air Filter

Company, Inc.
215 Central Avenue • Louisville 8, Kentucky

LAKE MEADOWS, Chicago, New York Life Insurance Company's fashionable community overlooking Lake Michigan. Architects and Engineers: Skidmore, Owings and Merrill; General Contractor: Turner Construction Company and S. N. Nielsen Company; Mechanical Contractors: The M. J. Corboy Corporation, Chicago and the Economy Plumbing and Heating Company, Inc., Chicago.

# Illinois High Vacuum Zone Control System Increases Comfort, Cuts Fuel Costs Here!



NERVE CENTER. This Illinois electronic control panel located in the boiler room is the control center for all buildings.

Chicago's Lake Meadows Project is one of the most modern, most functionally beautiful apartment areas in America. Down to the last detail, this nine-building project was designed for comfort.

Illinois Engineering Company heating products were selected in this "design for comfort". A complete electronic zone control heating system including traps, valves, electronic zone controls and high vacuum pumps was furnished by Illinois. The system automatically provides steam at the optimum pressure and temperature for maximum comfort and economy.

If you also have requirements for an automatic heating system that *increases comfort* and *decreases* fuel costs, call your local Illinois Engineering representative, or contact us directly for complete information.

illinois ENGINEERING

**Illinois Engineering Company**
2035 S. Racine Ave., Chicago 8, Ill.
*A Division of American Air Filter Company, Inc.*

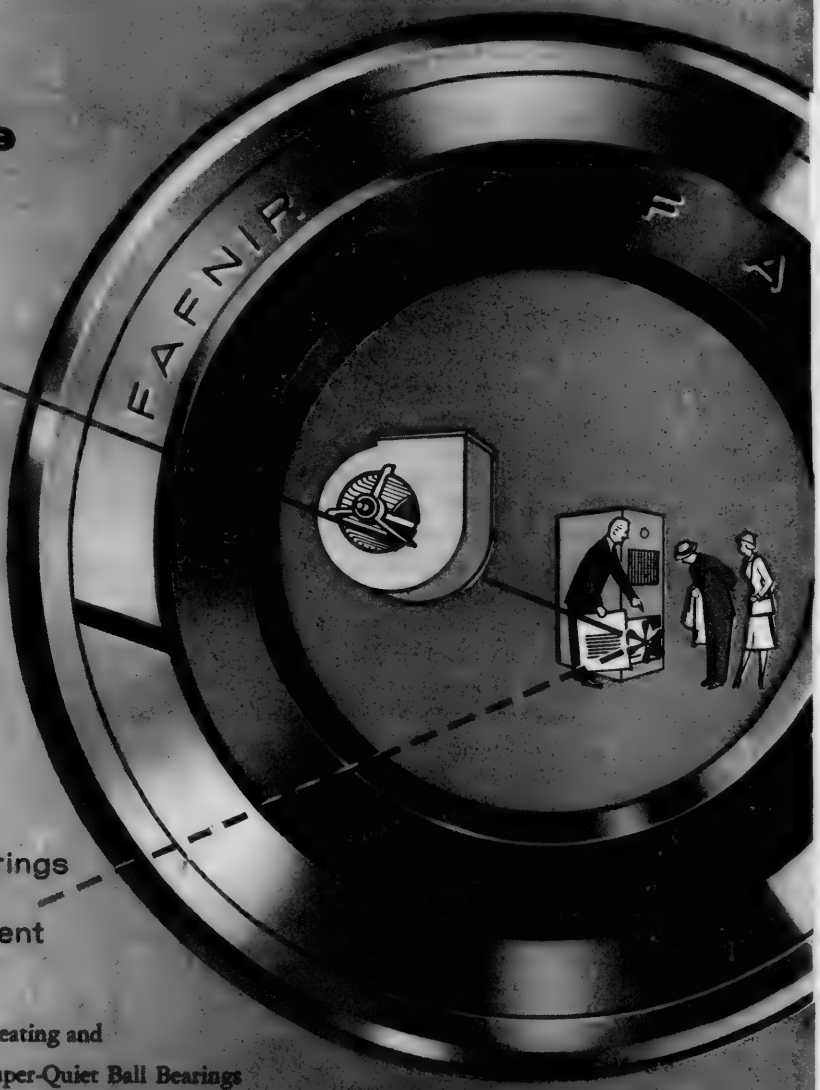
Heating Specialties

Power Specialties

Zone Control Systems

Selectotherm Control Systems

# How to produce a QUIET revolution... and win more sales!




Specify Fafnir **Super-Quiet** Ball Bearings for heating and air-conditioning equipment

Designed expressly for residential heating and air-conditioning equipment, Fafnir Super-Quiet Ball Bearings feature balls and races specially finished for quiet performance.

These advance-design bearings offer an inexpensive way to reduce noise, increase sales appeal. Prelubricated with factory-filtered grease and equipped with Plya-Seals to keep grease in and dirt out, they never need relubrication or maintenance. Moreover, Fafnir Super-Quiet Ball Bearings, with self-locking collars, are easiest of all to install... lock securely to the shaft with a twist of the wrist.

Available in sizes to fit brackets using popular-size sleeve bearings, Fafnir Super-Quiet Ball Bearings come mounted in electric current-conducting rubber cartridges and rubber-cushioned pillow blocks. Send for bulletin containing complete information and specifications. The Fafnir Bearing Company, New Britain, Conn.

**RCSM TYPE RUBBER CYLINDRICAL CARTRIDGES** are designed to be interchanged with other makes of ball bearing rubber-cushioned cartridges . . . feature Fafnir Super-Quiet Ball Bearings.

**RCR TYPE RUBBER CYLINDRICAL CARTRIDGES,** also equipped with the Fafnir Super-Quiet Ball Bearing, are designed for interchanging with sleeve bearing mountings.

**RPB TYPE RUBBER-CUSHIONED PILLOW BLOCKS,** a completely packaged, low cost Fafnir Super-Quiet Ball Bearing unit, features compact, two-piece, pressed-steel housing . . . is quickly mounted, affords unrestricted initial alignment in all directions.

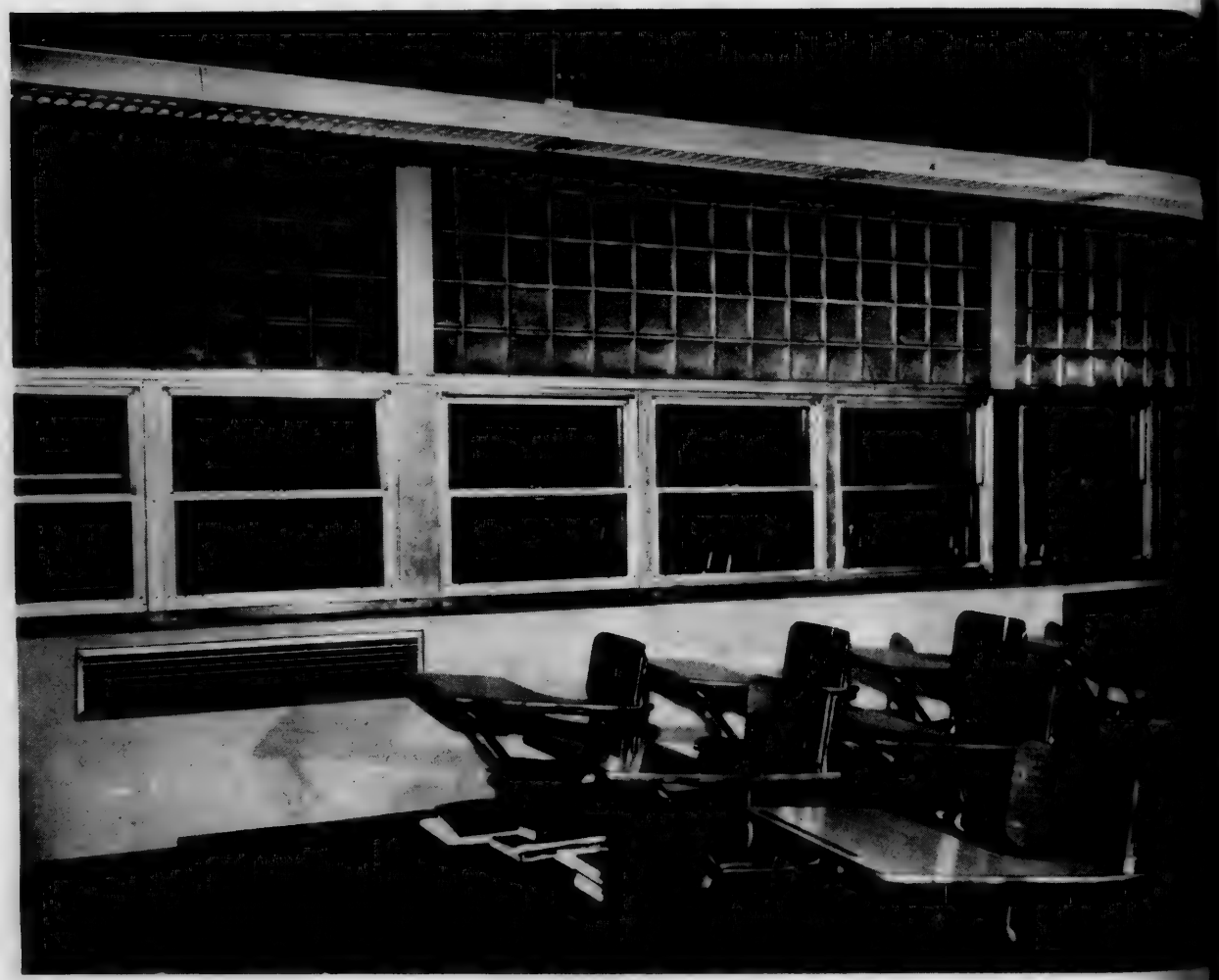
**FAFNIR**
**BALL BEARINGS**
MOST COMPLETE LINE IN AMERICA

# How high velocity provides maximum comfort for schools

The *Anemostat All-Air High Velocity* system of draftless air distribution offers many important advantages for heating and ventilating schools. • High velocity units, used with smaller than conventional ducts, save space and money. They substantially reduce sheet metal required, can be installed faster, at less cost. Since there are no coils in All-Air HV units, clogging and odors are eliminated. • Anemostat *All-Air HV* operate entirely with air processed in the main equipment room; there is, therefore, no need to break through the walls of the building for prime air make-up. The Anemostat *All-Air HV* units eliminate fans, filters, and electric motors in the school rooms. Units are quiet, need a minimum of maintenance from custodians. • On these pages are typical installations in which the *Anemostat All-Air High Velocity* system has been used successfully. Application data on your specific school heating, ventilating or air conditioning problem is available from Anemostat representatives or from the home office.

**Architects—attention please:**

Anemostat round, square and straight line diffusers with high velocity units are adaptable to a wide variety of architectural designs.

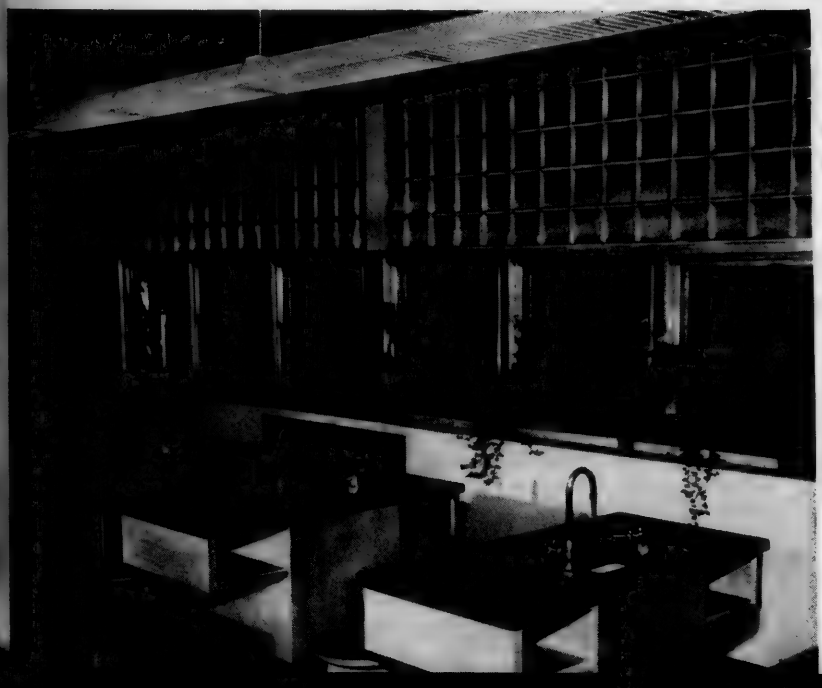


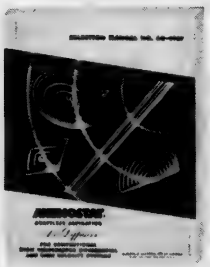
In this schoolroom Anemostat Type E Square Air Diffusers are installed in the ceiling.

Here Anemostat SLW Straightline Air Diffusers on the high sidewall provide draftless comfort.

Note the Anemostat UTW Straightline Air Diffuser located under the window in this classroom.

Anemostat UTW Straightline Air Diffusers are placed under the windows in this school laboratory.





Write on your business letterhead for your copy of

*New Anemostat Selection Manual 60*

to Anemostat Corporation of America, 10 East 39th Street, New York 16, N. Y.

**ANEMOSTAT: The Pioneer of All-Air High Velocity Systems**

# DETROIT'S V-600 COMBINATION GAS VALVE for CENTRAL HEATING UNITS!

Here is a completely new concept in gas valve design. A design that incorporates a gas valve, pressure regulator and safety pilot in a single, compact and completely integrated unit. A reliable combination valve which will simplify installation and maintenance and save you money.

## CHECK THESE V-600 ADVANTAGES

- ✓ UNIQUE DESIGN
- ✓ DEPENDABLE
- ✓ ECONOMICAL TO APPLY
- ✓ GOOD FOR ALL GASES
- ✓ SAFE LIGHTING
- ✓ AVAILABLE FOR 100% SHUT-OFF
- ✓ LARGE CAPACITY . . . UP TO 300,000 B.T.U. PER HOUR

*For complete information, write Detroit Controls Division, 5900 Trumbull Avenue, Detroit 8, Michigan.*

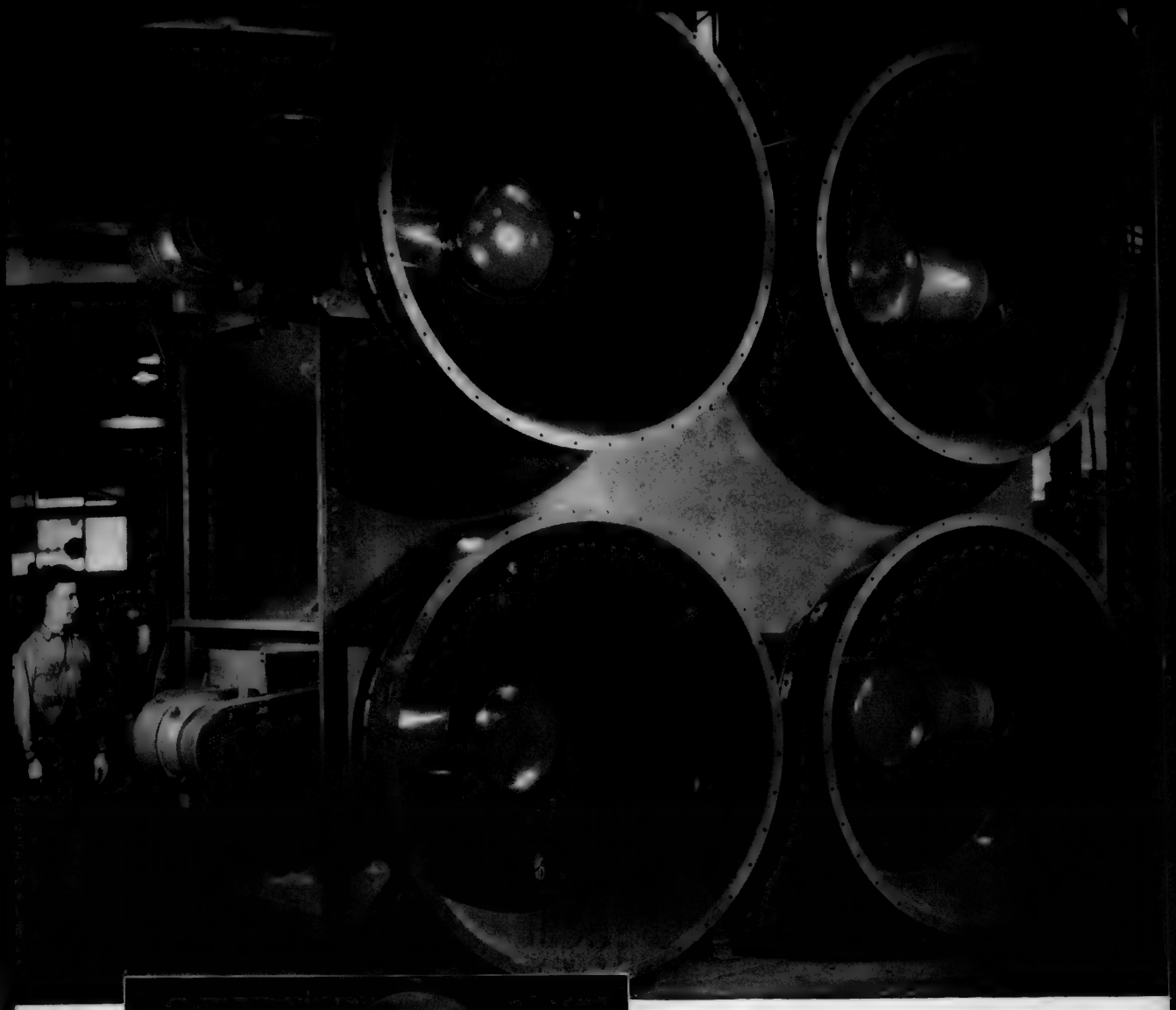
Quality Protects Your Investment-- AMERICAN-Standard Quality Is Available At No Extra Cost.

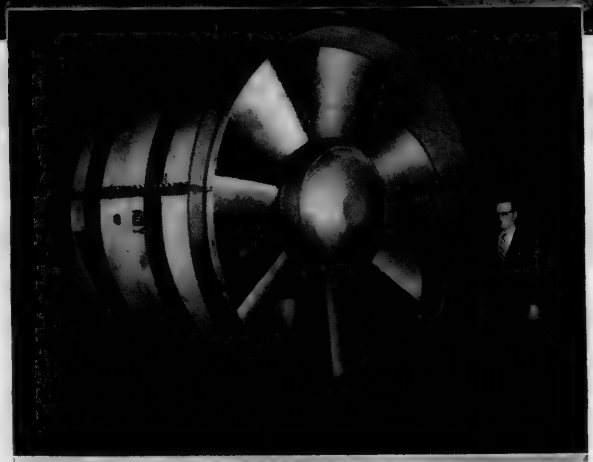
5900 Trumbull Avenue
Detroit 8, Mich.

**DETROIT CONTROLS**

Division of AMERICAN-Standard

Canadian Representatives: RAILWAY AND ENGINEERING SPECIALTIES LTD., Montreal, Toronto, Winnipeg





**LING PACKAGE!**
oiling a large boiler
to complete satis-
these 4 "Buffalo"
Flow Fans shown
were made up as a
package" for sim-
installation. Quiet
hly efficient, they
lot of air — and
a lot of excess

**000 CFM ACID**
**AE HANDLER!**
6" stainless steel
o" Axial Flow Fan
with cast Alumi-
eel, in a rayon mill
a. One of four in
ne mill, ordered
period of six years.

**ACK EXHAUST!**
at lower right,
o" Axial Flow Fans
d right into stacks
per mill do a thor-
ob of exhausting
Duct-size design
installation advan-
these fans.

for Bulletin 3533
k the performance
stallation advan-
r these job-proved

**BUFFA NY,** BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

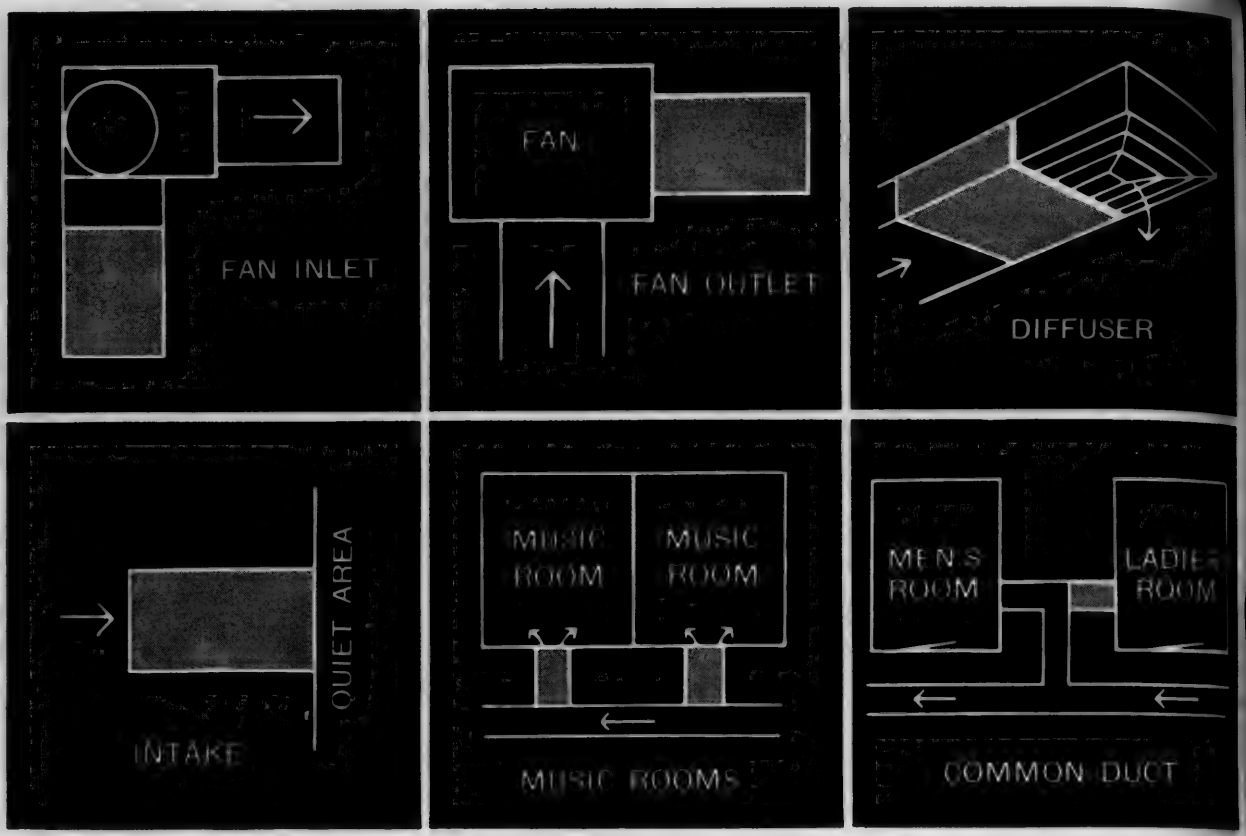
VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

# WHY "BUFFALO" AXIAL FLOW FANS?

*Efficiency and quiet operation* — extreme efficiency where duct connections are straight, to take advantage of straight-line axial air flow. Guide vanes in "Buffalo" Vaneaxial Fans eliminate swirling motion of air — convert this energy to forward thrust. Varied pitch of "Buffalo" airfoil wheel means uniform air flow over the blades.

Installation advantages include lighter weight with rugged construction and cylindrical shape. "Buffalo" Axial Flow Fans are simple to install as part of round ductwork — and require less support than centrifugal fans of equivalent capacity. Available direct-connected, or V-belt driven thru streamlined fairing with motor outside of air stream.

"Buffalo"

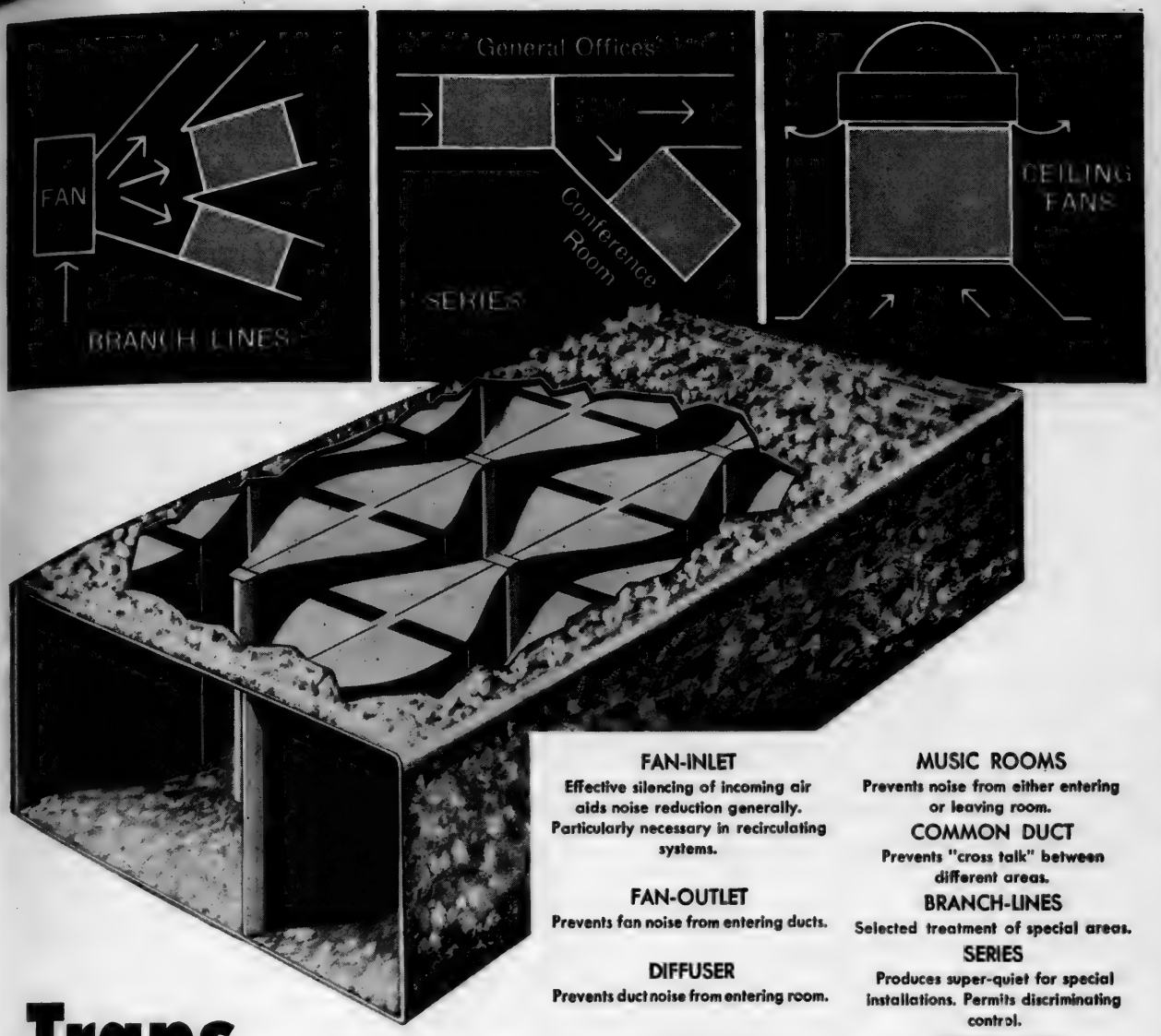



# Every Building Needs Aircoustat® Sound

## AIRCOUSTAT silences noises of all frequencies

Eliminate disturbance, distraction and irritation caused by noises escaping from one area to another through ductwork.

Install AIRCOUSTAT Sound Traps. AIRCOUSTAT eliminates guesswork, wasted space and unnecessary expense of duct lining. You can guarantee your client trouble-free performance. You can estimate with complete confidence the performance of particular applications. If AIRCOUSTAT fits geometrically, it fits acoustically.




# Traps

**FAN-INLET**
Effective silencing of incoming air aids noise reduction generally. Particularly necessary in recirculating systems.

**FAN-OUTLET**
Prevents fan noise from entering ducts.

**DIFFUSER**
Prevents duct noise from entering room.

**INTAKE**
Prevents outside noise from entering quiet area.

**MUSIC ROOMS**
Prevents noise from either entering or leaving room.

**COMMON DUCT**
Prevents "cross talk" between different areas.

**BRANCH-LINES**
Selected treatment of special areas.

**SERIES**
Produces super-quiet for special installations. Permits discriminating control.

**CEILING FANS**
Prevents fan and exhaust noise from disturbing particular areas.

## traveling from one area to another through ductwork

AIRCOUSTAT saves you space. Its greater effectiveness permits smaller-sized ducting. It eliminates bulky mufflers.

For more details, write to KOPPERS COMPANY, INC. Industrial Sound Control Dept., 6310 Scott Street, Baltimore 3, Md.

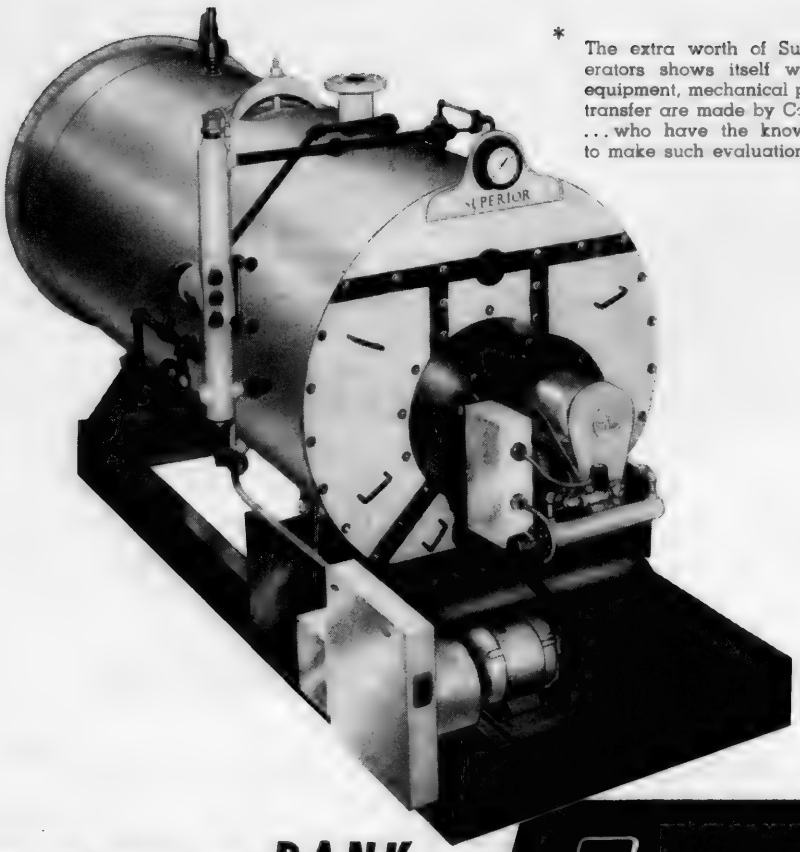
KOPPERS

## INDUSTRIAL SOUND CONTROL

*Engineered* Products Sold with *Service*

the man to ask

# is your ENGINEER*

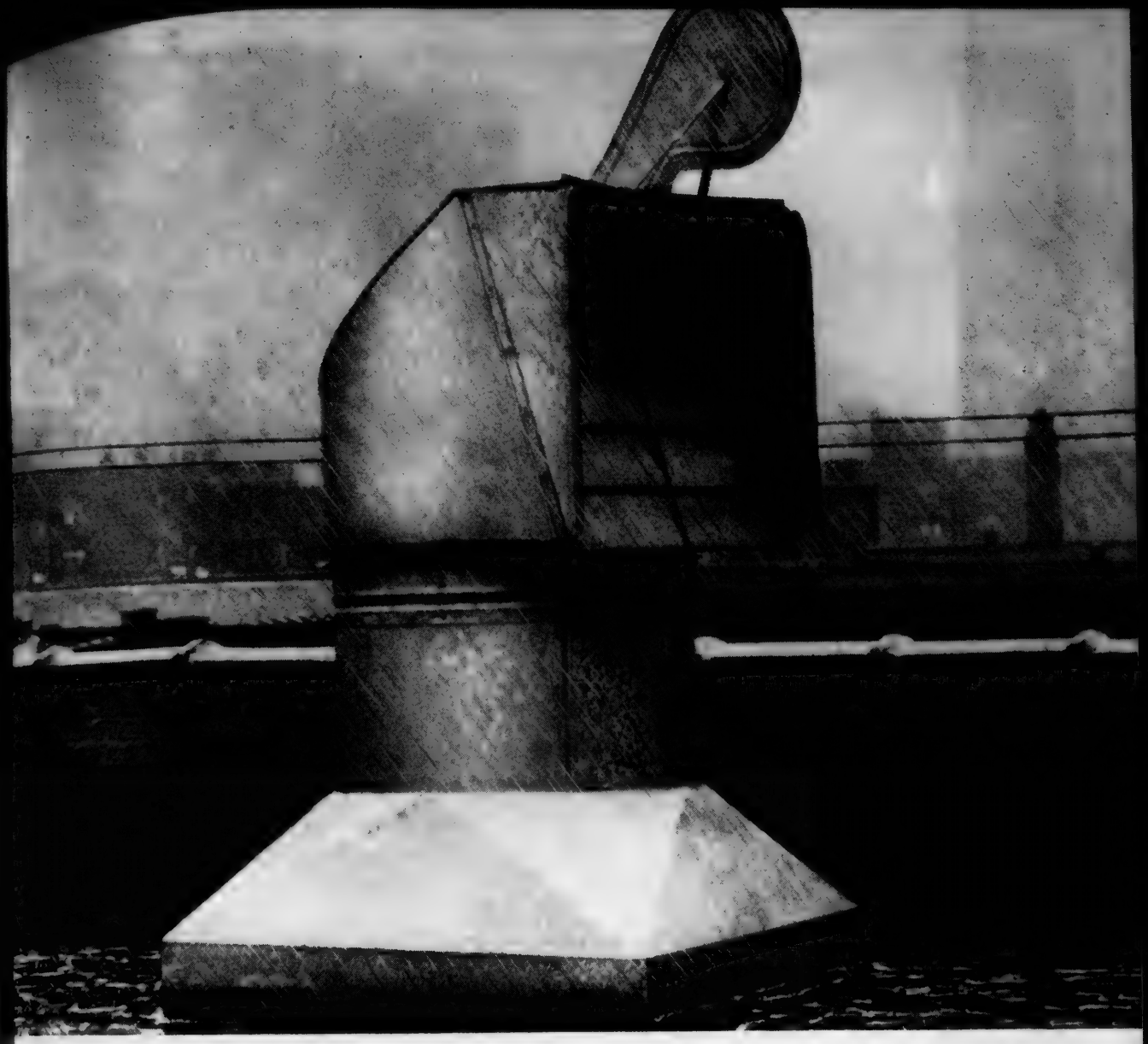



* The extra worth of Superior Steam Generators shows itself when evaluation of equipment, mechanical principles, and heat transfer are made by Consulting Engineers . . . who have the knowledge and ability to make such evaluation.

*for performance you can* **BANK** *on*

**SUPERIOR COMBUSTION INDUSTRIES INC.**
**TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.**

SUPERIOR
STEAM GENERATORS



# WEIRKOTE'S® skin-tight zinc coating never gives rust a break

No wonder the steady shift is to Weirkote zinc-coated steel! No wonder more and more spec sheets insist on Weirkote—like this:

*SHEET METAL WORK—Materials—Galvanized steel. Unless otherwise specified, this shall be of 26-gauge galvanized sheet steel, of "Weirkote" with make and gauge stamped on each sheet.*

Weirkote's continuous-process zinc coating is uniformly skin tight, flawless. It's made that way to *stay* that way through the toughest fabrication and roughest job-site handling. No flaking, no peeling.

It brings first-class corrosion resistance and long life to roof ventilators, heating and ventilating ductwork, ducts for dust and fume removal, rain drainage systems, water type air coolers, other sheet metal uses. Low first cost, low maintenance cost.

*Free Weirkote Booklet*

*Send for the new Weirkote booklet today. Write Weirton Steel Company, Dept. N-17, Weirton, West Virginia.*

WEIRTON STEEL COMPANY

**WEIRTON STEEL COMPANY**

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

Typical plant ceiling showing foil-faced Pittsburgh Fiber Glass insulation in position.

# "Pittsburgh Superfine is easiest to apply... most efficient insulation for steel buildings"

SAYS MR. CHARLES W. JACKSON, *President of Quonco, Inc., fabricated steel building sales and erection firm of Indianapolis, Ind.*

Experience has taught Quonco, Inc., that it takes more than conventional material to properly insulate a fabricated steel building. First of all, the material must be self-supporting and preferably blanket-type. It must be lightweight and very easy to handle. Further, it must be extremely efficient in insulating against heat loss and absorbing noise.

Quonco found all of these insulation advantages in one product—Pittsburgh Superfine Fiber Glass. Mr. Jackson, President of the Indianapolis firm, sums up the advantages this way: "Since Pittsburgh Superfine in our buildings reduces heat loss to only ⅓ that of conventional masonry buildings, our customers can plan for a lower initial investment in heating equipment and cut their estimated fuel costs considerably." As an example, Mr. Jackson cites the case of the world's largest fabricated steel building—7½ acres—in which 300,000 sq. ft. of Pittsburgh Superfine was used. Only one of the plant's three boilers, and 7 of the plant's 12 air supply units is needed to maintain a comfortable 75° for over 3000 employees. Even during hot summer months, temperatures are 10° to 15° cooler inside without air conditioning.

If plant and office modernization or construction is part of your current plans, be sure to know about the unusual features and savings that Pittsburgh Superfine insulation can provide you. For your copy of Bulletins F-100 and F-140, write Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pa. For immediate service on your specific problem, you can call the nearest Fiber Glass Division sales office listed below.

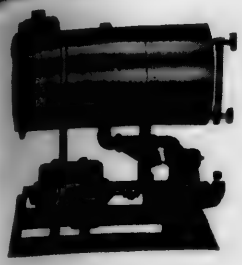
**PITTSBURGH SUPERFINE FIBER GLASS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY**

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, and St. Louis

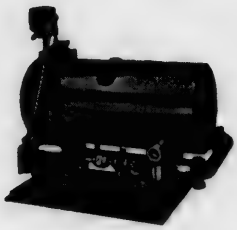
FIBER GLASS

**PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS**

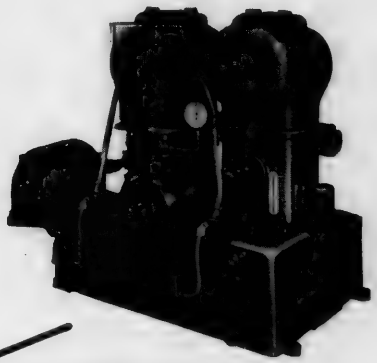
PITTSBURGH PLATE GLASS COMPANY



TYPE "TM" TURBINE PUMP

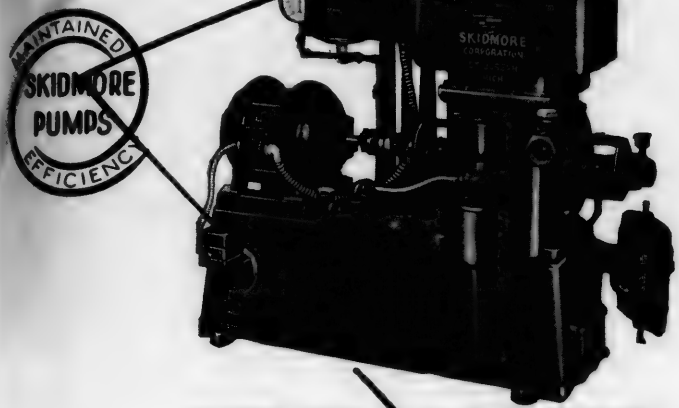


TYPE "HS" CONDENSATE PUMP



VACUUM PUMP—duplex unit

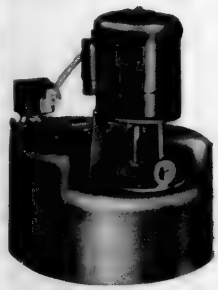
# EFFICIENCY REMAINS CONSTANT— YEAR AFTER YEAR...




**VACUUM PUMP—single unit. The SKIDMORE Vacuum Pump automatically adjusts itself to the varying conditions of the system. Capacity remains constant without adjustments or expensive repairs.**

SKIDMORE TYPE "TM" CONDENSATE PUMP

***Send Coupon For Bulletins***



TYPE "CVS" VERTICAL PUMP

***There's a Skidmore Pump built for every heating requirement.***

**SKIDMORE CORPORATION**

ST. JOSEPH, MICH.

**SKIDMORE CORPORATION, ST. JOSEPH 5, MICHIGAN**

**Please send bulletins on the following pumps checked below.**

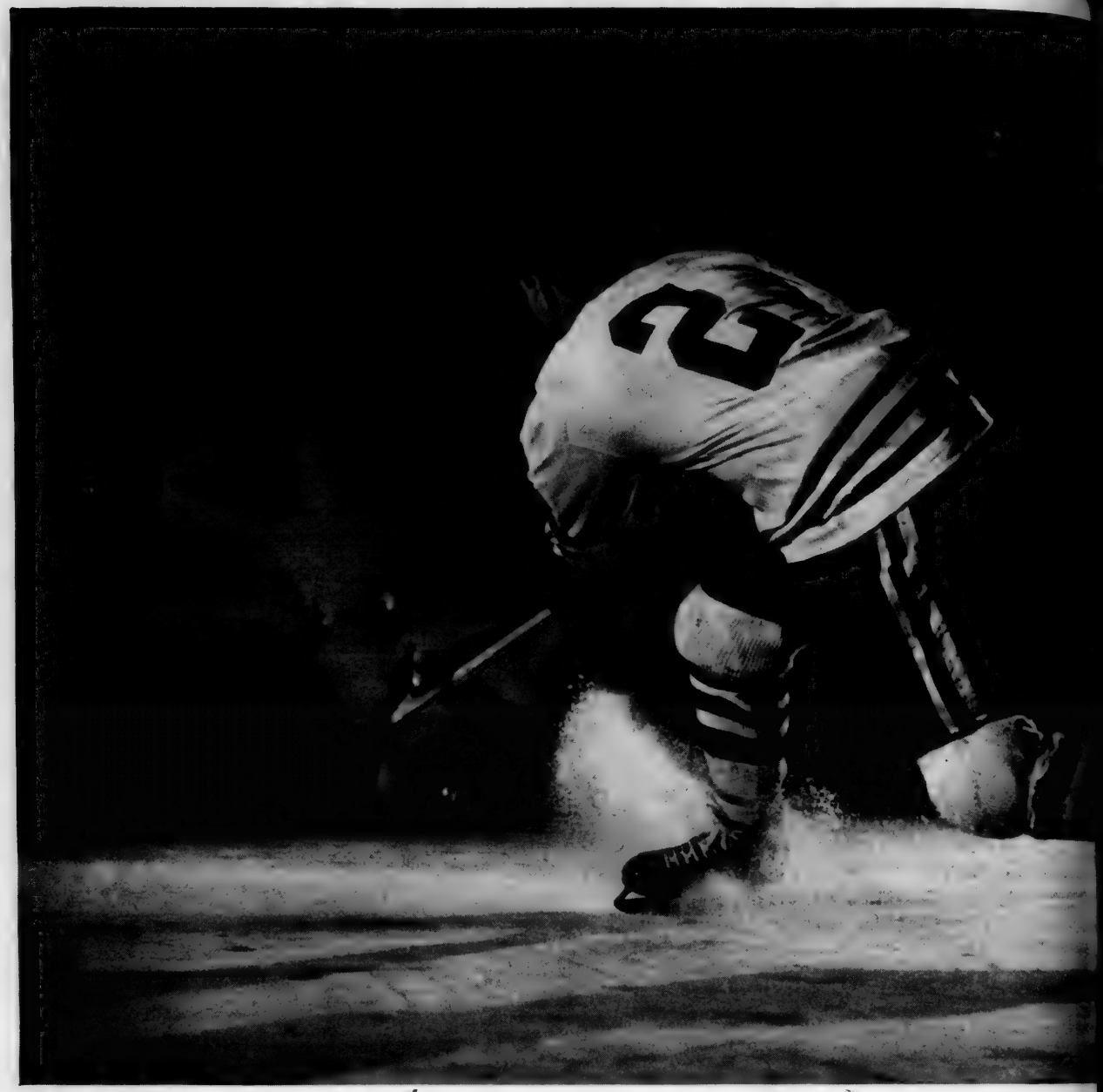
**CVS TM HS UV VACUUM**

**Name** .....

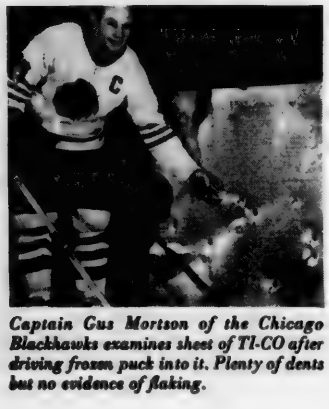
**Firm** .....

**Address** .....

**City** ..... **State** .....



# BLACKHAWK ACE FAILS TO FLAKE TI-CO



*Captain Gus Mortson of the Chicago Blackhawks examines sheet of TI-CO after driving frozen puck into it. Plenty of dents but no evidence of flaking.*

Gus Mortson, Captain of the famous Chicago Blackhawks, used his hardest driving shot in slamming a frozen puck into a sheet of Inland TI-CO galvanized steel. Time after time, at speeds up to 100 m.p.h., the puck banged into the sheet but the zinc coating on TI-CO stayed put . . . not a sign of flaking. This brutal test illustrates how TI-CO can take it—even when subjected to far rougher treatment than encountered in normal use. Further proof that TI-CO can withstand even the most severe fabricating operations or the toughest handling and still retain its protective zinc coating. No chance for rust to get a foothold.

# For the Big Jobs Where Material and Labor Costs Run High, Sheet Metal Shops are Switching to Inland TI-CO!

More and more sheet metal contractors are finding that they can realize important savings in labor and materials by using Inland TI-CO Galvanized Sheets . . . especially on the big jobs.

TI-CO's non-flaking quality becomes increasingly important as the runs of fabricated components get longer. Many man-hours, both in the shop and on the job, are lost when the zinc coating on ordinary pot galvanized sheets flakes off in the lock-seamer and forming presses, or while the part is being installed. With TI-CO, made by the patented continuous process of galvanizing, the zinc coating stays put even under the most severe fabricating operations. Down-time due to zinc clogging of machines and lost labor caused by splitting of the base metal or failure of the coating, necessitating costly "make-overs," is eliminated.

Typical of large air handling equipment jobs on which TI-CO was used is the new western headquarters building of the America Fore Insurance Group recently completed in Chicago. Over 63 tons of TI-CO went into the ductwork for this modern, 15 story office building. Jim Mraz, Supt. of Narowetz Heating & Ventilating Company, sheet metal contractor on the job, is very enthusiastic about the way TI-CO performs both in the shop and on the site. "With TI-CO sheets we keep shop time down to a minimum and end up with a better looking, longer lasting installation," he said, "because the zinc coating on TI-CO just doesn't flake."

A good example of a specialty sheet metal job involving long production runs is a project recently handled by the Bloomer Heating & Ventilating Company, Chicago, Illinois, for the Ford Aircraft Engine Plant. The job consisted of 8,000 special insulating panels made by riveting sheets of TI-CO galvanized steel to both sides of a steel framework. These panels, packed with a heavy insulating material, were used to soundproof four cells where jet engines are tested. The 300 tons of TI-CO used for the project provided a durable, corrosion resistant surface for the panels that made painting unnecessary. Shop Superintendent, Ernest Ellis, in expressing complete satisfaction with TI-CO, said, "Its non-flaking quality paid off on our production line. The coating stayed put even under tough treatment by our automatic riveting machines."

Make certain you're getting maximum profit out of every sheet metal job you do, large or small. Look for the brand of non-flaking Inland TI-CO on every shipment of galvanized you receive.

**TI-CO Galvanized Sheets are Readily Available!**

*The terrific demand for this high quality sheet has kept TI-CO in short supply since its development. Now, additional production facilities have been completed making greater quantities available.*

*TI-CO is available in cut sheets or coils, in gages 8 to 30 inclusive and widths as great as 60 inches. TI-CO comes with dry, oiled or chemically treated surfaces. Consult your local steel distributor or Inland representative for your needs.*

## INLAND STEEL COMPANY

*38 South Dearborn Street • Chicago 3, Illinois*

*Sales Offices: Chicago • Milwaukee • St. Paul • Davenport St. Louis • Kansas City • Indianapolis • Detroit • New York*

INLAND TI-CO

Look for this brand—
your assurance of
non-flaking performance

# Air conditioned comfort without hum

## Commercial air-conditioning installations use Louis Allis "quiet" motor

In today's modern executive and general offices, silent operation is a prime specification for the air-conditioning installation. Busy people suffer adversely from any resonance or hum induced in the system by the drive motor. Efficiency drops — irritability climbs — and worker output falls.

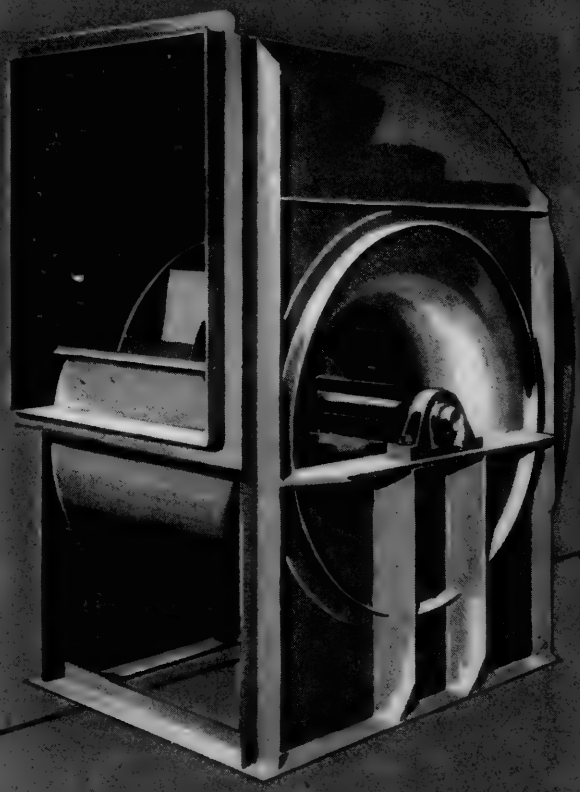
That's why Louis Allis motors — the motors with the built-in "hush" — are finding wide acceptance in air-conditioning service. They are specifically *designed* to be quiet. Every bearing is noise tested . . . end bells and frame are engineered for low, low noise levels . . . sturdy, heavy-section cast-iron housing construction is remarkably resonance-fre Matching this desirable operating characteristic dependable maintenance-free construction: loch bearings mean extra long bearing life, and Louis All insulation protects against moisture and heat assure steady, dependable performance even und the most adverse operating conditions.

Make us prove it. Contact your Louis Allis Distric Office and arrange to have an expert motor sal engineer stop by and advise you on your air-cond tioning drive installation. Or write the Louis All Co., 454 East Stewart St., Milwaukee 1, Wisconsi

**LOUIS ALLI**

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVE

# 3 maximum efficiency units to solve your air handling problems...



## IPL FANS

For standard duty and heavy industrial use . . . quiet, non-overloading compact . . . available in all standard classes and constructions . . . capacities from 1000 to 250,000 CFM against resistance of free delivery to 12" static pressure . . . bulletins 544 and 561.

## UNIT HEATERS

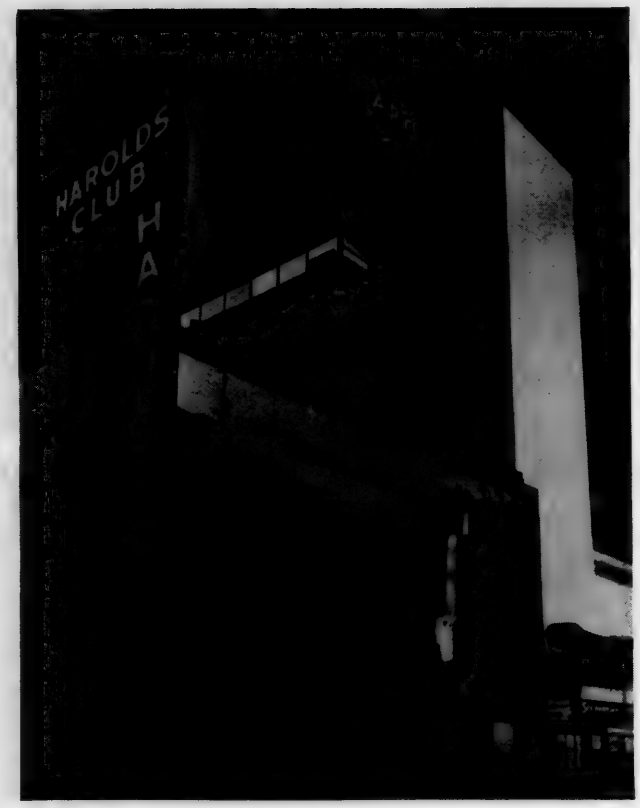
For continuous service and efficient operation . . . both horizontal and vertical type . . . complete flexibility with high diffusion and quiet operation . . . wide range of capacities, 10 basic sizes . . . bulletins 552 and 553.

## STEELFIN

Heavy duty heat surface . . . corrosion-resistant, constructed of alloy steel, increasing strength without adding to weight . . . hot dip metallic coating over all, including headers, affords perfect bonding and conductivity . . . unprecedented record of trouble-free service . . . bulletin 571.

nyb THE NEW YORK BLOWER COMPANY

SALES OFFICES: 5147 SOUTH SHIELDS AVENUE • CHICAGO 15




*Ordinary Thermostats Couldn't Handle This Job!*

*Comfostats Take It In Stride and Highlight*

*One of the Most Flexible*

*Air Conditioning Systems on Record!*

*It's the Story of*

# HAROLD'S CLUB—RENO

On a given weekend, up to 19,000 people may heed the call of Lady Luck and flock to Reno's fabulous Harold's Club*. The doors are open 24 hours a day, seven days a week. It not only is the biggest, but it's the most comfortable casino in the country.

### UNUSUAL CONTROL PROBLEMS

Reno's design temperature of 95 F and a huge volume of customers are common enough air conditioning control problems.

But, unlike other types of buildings where the cooling load is either concentrated in one or a few areas or fairly evenly distributed throughout, cooling loads at Harold's Club are concentrated around crowded gaming tables and shift constantly and rapidly from table to table and game to game. The sensible to latent ratio of the load varies widely from one location to another *within* rooms as well as among rooms.

### MULTIPLICITY OF SMALL ZONES

Response to the constantly shifting loads is provided by a high velocity, double-duct system equipped with a mixing unit for each gaming table or area. Mixing units are installed above the ceiling and discharge through aspirating-type ceiling diffusers.

The key to the successful operation of this highly flexible system is its regulation by means of a Johnson Pneumatic Control System. For high accuracy control, Johnson *Comfostats* are pendant-mounted beneath the diffusers and directly above each table, which is the point of greatest load concentration and maximum aspirating effect. This assures instant response to load changes, with accurate proportions of cool and warm air available for each table.

### COMPENSATE FOR HUMIDITY LEVELS

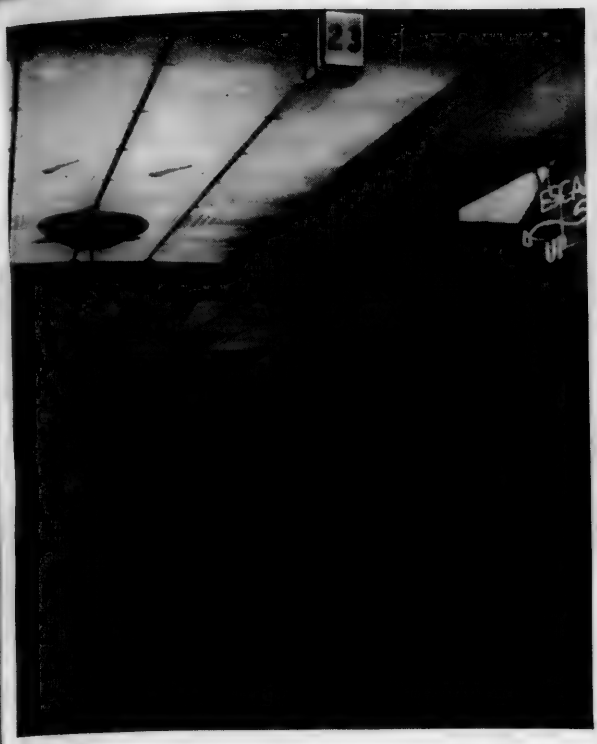
With *Comfostats*, customers of Harold's Club enjoy an exceptional degree of comfort. These humidity-compensated thermostats, which are made exclusively by Johnson, reduce the dry bulb temperature by an appropriate amount as the humidity increases, thus compensating for the high latent component of the load that exists wherever a crowd gathers. Each of the 110 diffusers is individually controlled by its own *Comfostat*, so that the system is actually zoned for each gaming area or table. System flexibility and response of the pneumatic controls provide cooling where and as needed, with a minimum of installed refrigeration capacity.

*Harold's Club, Reno, Nevada, Ferris & Erskine, architects, Reno; Clyde E. Bentley, mechanical engineer, San Francisco; Earl O. Stice Co., mechanical contractor, Glendale, California.

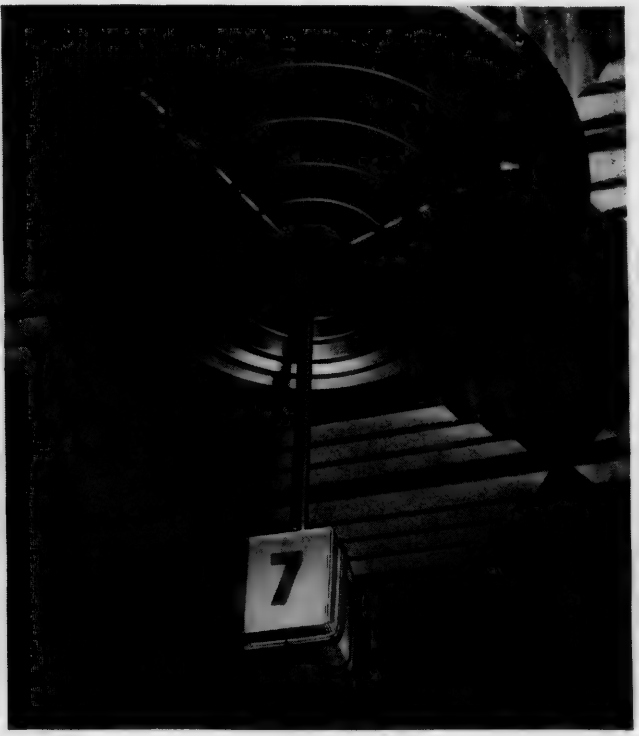
**JOHNSON CONTROL**

PNEUMATIC SYSTEMS

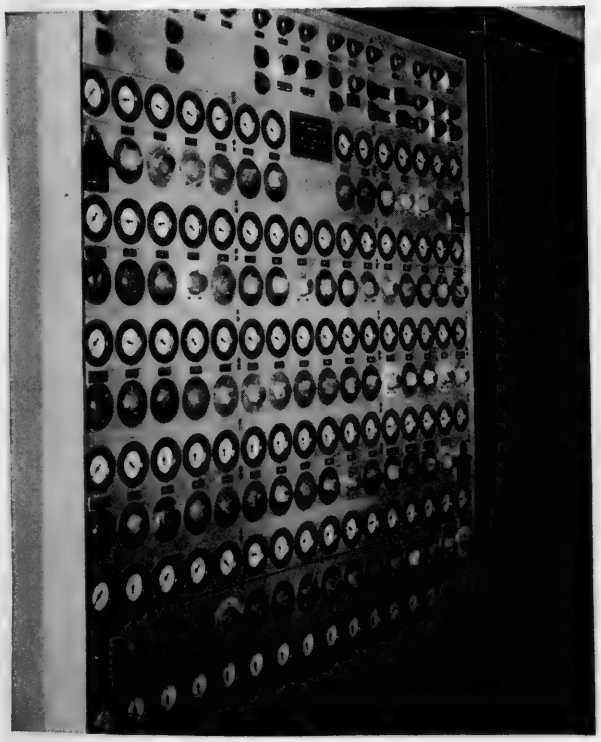
DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885




**110 Zones of Comfort.** What appear to be section number markers over each gaming area are actually pendant-mounted Johnson *Comfostats*. There are four individually controlled comfort zones in the view above. Harold's Club offers a choice of 750 slot machines, plus roulette, black-jack, craps, and cards.



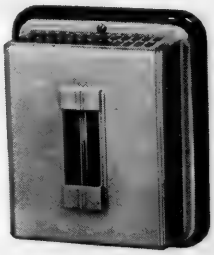

**Mixing Unit Control.** Each air outlet is zoned and has its own *Comfostat* and a remote temperature indicating bulb suspended from the center of the diffuser. The temperature in each zone can be conveniently checked from a remote indicator in the engineer's office.



**Control Center.** Operation of the system is simplified by this control center which permits the engineer to reset *Comfostats* without leaving his office. Also, with remote reset, unoccupied areas can be held at higher temperatures to reduce cooling costs.


**Control from "Effective" Temperatures with Johnson *Comfostats***

Johnson *Comfostats* control from "effective" temperatures, regulating temperature in proportion to humidity changes. Available in room, *Dual* room, insertion and submaster models. *Comfostats* are made only by Johnson. Mail the coupon for full details.



T-411 *Comfostat*

**No matter how exacting your needs, a Johnson Pneumatic Control System can meet your requirements. Next time you have a control problem, turn it over to the specialist Johnson organization, the leader in pneumatic control. A nearby Johnson engineer will gladly give you his recommendations without obligation.**

**JOHNSON SERVICE COMPANY**

**507-C, East Michigan Street, Milwaukee 1, Wisconsin**

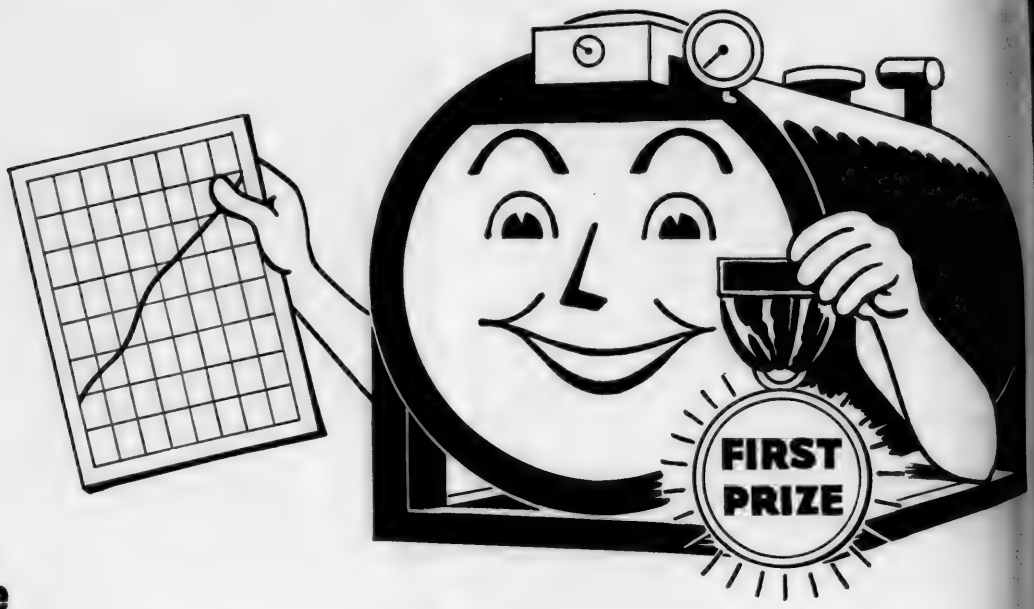
Please send me your free literature describing Johnson *Comfostats*.

Name & Title_____

Firm_____

Address_____

City & State_____




# The Boiler they threw the book at

You know exactly what a Continental Automatic Boiler will do, even while it's still in our factory. That's because we test and re-test it, at every stage in its manufacture, then fire-test it before shipment for a final performance-proof of its guaranteed efficiency of more than 80%.

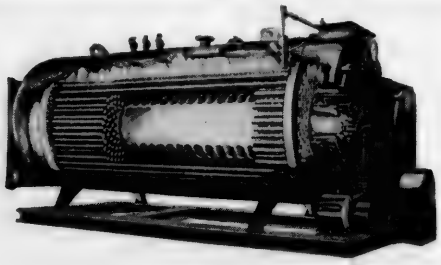
With a Continental, guesswork is out. You specify the right size for the job, not an oversized boiler just to play it safe. And each boiler-burner unit is rated on its own test-floor performance, not its square feet of heating surface.

Continental efficiency stays almost constant over a wide load range and a long service life. When plant expansion requires greater steam production, it's easy to add another performance-proved, fire-tested Continental Automatic Boiler – the boiler with the exclusive "Spinning Gas" feature. For details, send for Bulletin BE-3.

**BOILER ENGINEERING & SUPPLY COMPANY, INC.**

**7 Manavon Street, Phoenixville, Pa.**

**The Continental AUTOMATIC BOILER**



Cut-away view of typical Series A Continental Automatic Boiler, firing oil and/or gas. Other models from 20 to 500 hp, with on-off, low-high-low or modulating controls. For steam heating or process work at pressures from 15 to 250 pounds, or for hot water heating at low or high temperatures.

A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

## As in the New Orleans City Hall

New Orleans, La.

# get longer-lasting ducts with Wheeling SOFTITE® COP-R-LOY® Galvanized Sheets

28 large central air conditioning units and 1,122 small air handling units were needed for the new $7½ million New Orleans City Hall. Mindful that the ducts should be as long-lasting and trouble-free as possible, Wheeling SOFTITE Cop-R-Loy Galvanized Sheets were used. These are the same type of copper-bearing sheets proved to *last up to 33 times longer!*

For full details, contact the Wheeling warehouse or sales office nearest you.

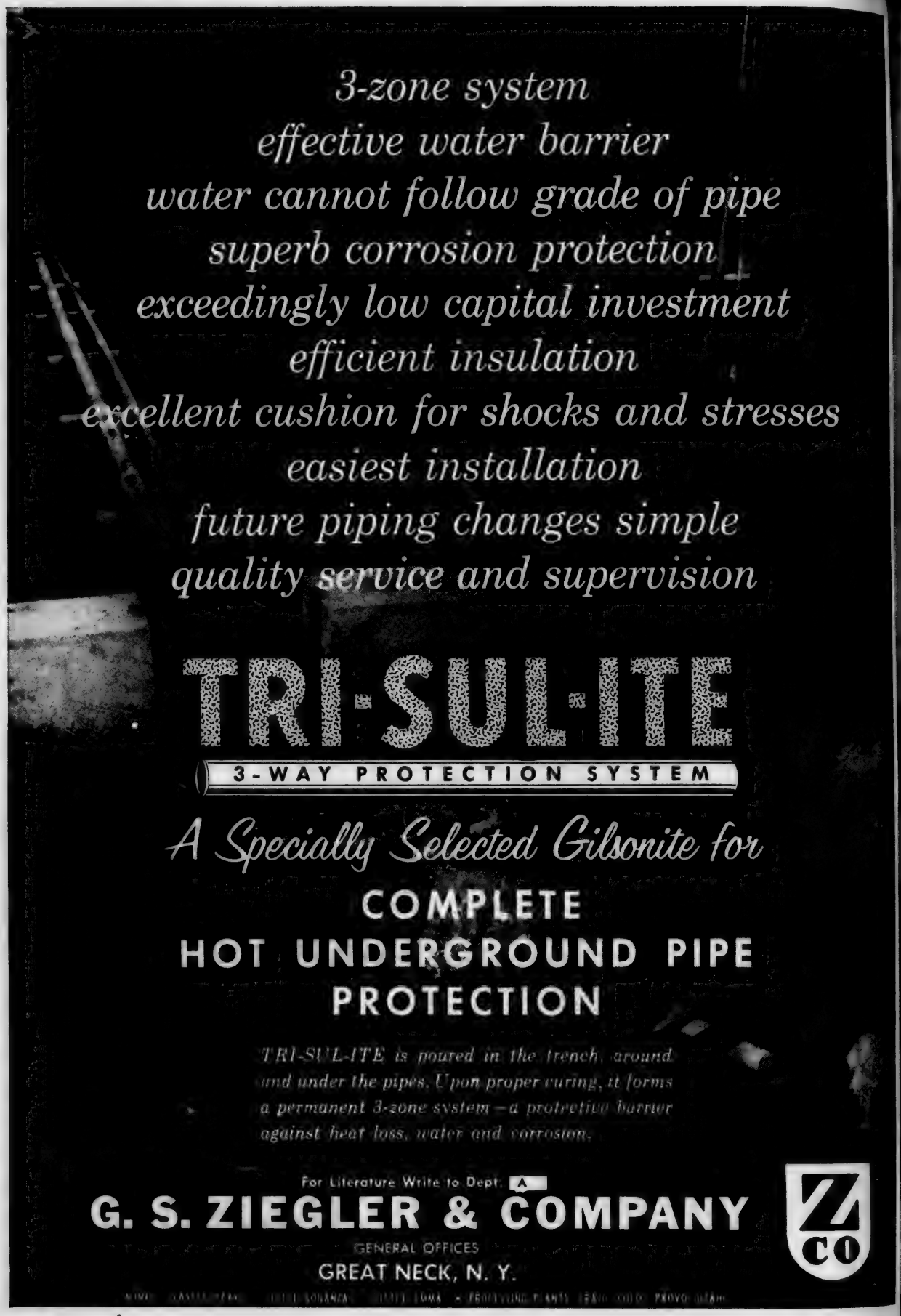
52 vertical ducts distribute 100,000 cfm of fresh air to 1,122 perimeter units—all Wheeling's new SOFTITE Cop-R-Loy Galvanized Sheets.

Wheeling SOFTITE Cop-R-Loy Galvanized Sheets were used for the 1,600 horizontal air distribution sections plus 62 vertical shafts.

Wheeling

**WHEELING CORRUGATING COMPANY**
WHEELING, W. VA.
**IT'S WHEELING STEEL**

***IMMEDIATE DELIVERY ON ALL STOCKED ITEMS FROM THESE WAREHOUSES:*** BOSTON, BUFFALO, CHICAGO, COLUMBUS, DETROIT, KANSAS CITY, LOUISVILLE, MADISON, MINNEAPOLIS, NEW ORLEANS, NEW YORK, PHILADELPHIA, RICHMOND, ST. LOUIS. ***SALES OFFICES:*** ATLANTA, HOUSTON


3-zone system
effective water barrier
water cannot follow grade of pipe
superb corrosion protection
exceedingly low capital investment
efficient insulation
excellent cushion for shocks and stresses
easiest installation
future piping changes simple
quality service and supervision
TRI-SUL-ITE
3-WAY PROTECTION SYSTEM
A Specially Selected Gilsonite for
COMPLETE
HOT UNDERGROUND PIPE
PROTECTION
TRI-SUL-ITE is poured in the trench, around and under the pipes. Upon proper curing, it forms a permanent 3-zone system—a protective barrier against heat loss, water and corrosion.
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ILG ELECTRIC UNIT HEATERS bring you electric heat at its best — quiet, fan-circulated, room-wide heat. Quick heat... clean, automatic heat... as dependable as the power that flows through the durable, non-glow type heat element. No exposed wires or terminals in air stream. Heavy duty construction with permanently lubricated motor... built-in overheat protection. Easy to mount from wall or ceiling. Nine sizes, capacities 1½ KW to 15 KW.

ILG®

**The Man from Ilg** can help you choose the right capacity for any application. He is ready to go to work for you. Plan to talk to The Man from Ilg about your next heating or ventilating installation.

**ILG ELECTRIC VENTILATING CO.**

2851 N. Pulaski Road, Chicago 41, Illinois  Offices in 56 Principal Cities

**Send for New Bulletin on Electric Unit Heaters**

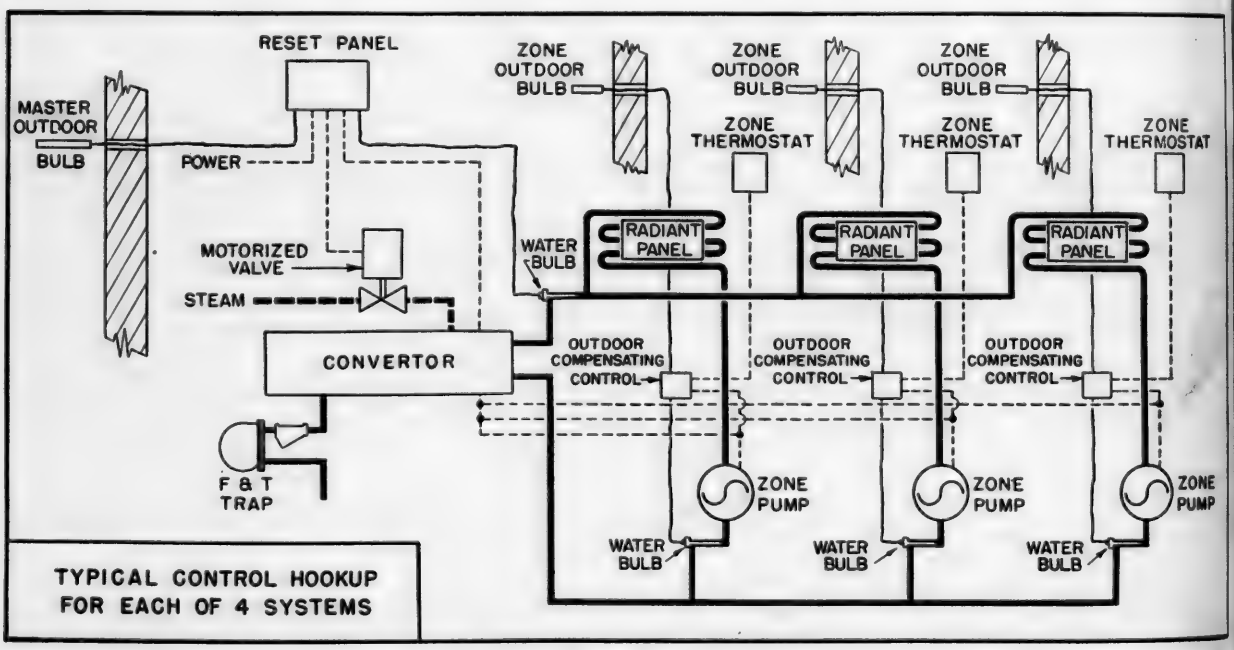
Here is complete information on specifications, sizes, construction features, etc. Write today for your free copy. Request Bulletin 807.

# Simple, economical solution of complex heating control problem

## ...FOR NEW 1000-BED HOSPITAL

### Highlights of this SARCOTHERM CONTROL SYSTEM

1. Provides *automatically controlled* heating comfort for 13 separate radiant heating zones.
2. Maintains uniform inside temperature in each zone by *automatically adjusting* flow of hot water through system to compensate for changes in outdoor temperature and room load demand.
3. *Automatically controls* flow of steam to each of 4 heat exchangers, varying temperature of hot water supplied to each radiant heating system in response to outdoor temperature changes.
4. *Combines simplicity* with accuracy and dependability . . . instruments are simple, rugged . . . easy to adjust and maintain.
5. *Insures low installed cost* . . . because of fewer controls, less wiring.




**UNDIVIDED RESPONSIBILITY**

***Complete weather-compensated control system plus heating specialties from one dependable source.*** In addition to Sarcotherm control system components illustrated above, Sarcotherm and Sarco products installed include Sarcofin radiation, thermostats, balancing fittings with access boxes, radiator valves, thermostatic steam traps, Thermo-Dynamic steam traps and other accessories.

WEATHER-COMPENSATED CONTROL SYSTEMS FO

**Milledgeville State Hospital, Milledgeville, Georgia**
**1000-bed Psychiatric Building No. 2**

Equipped with Sarcotherm Weather-Compensated Control System for radiant heating. **Architects** — Gregson & Associates, Atlanta, Ga. **Mechanical Engineers** — Ammons, McClure & Caldwell, Atlanta, Ga. **General Contractor** — Jordan Contracting Company, Columbus, Ga. **Mechanical Contractor** — Spivey Plumbing & Heating Co., Dublin, Ga.

## OTHER ADVANTAGES OF SARCOTHERM SYSTEMS

**Application engineering** — Sarcotherm engineers, backed by years of experience in heating control systems, assist consulting engineers with individualized system diagrams.

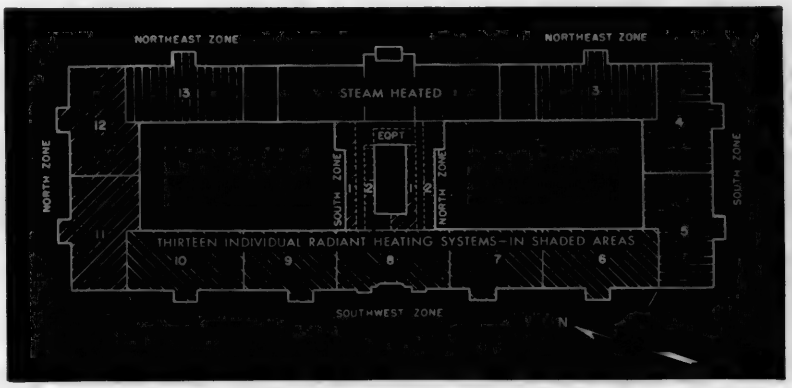
**Easy to install** — special installation drawings and diagrams of the complete system are furnished for each job.

**Easy to maintain and adjust** — by regular maintenance men, because of construction simplicity, fewer parts.

**On-the-job assistance** — to contractors from Sarcotherm's field engineers.

★ ★ ★

**FOR COMPLETE CONTROL SYSTEM CATALOG,** write . . . Sarcotherm Controls, Inc., Empire State Bldg., New York 1, N. Y.




**Details of heating system**

Building supplied with medium pressure steam from boiler house about 3000 feet away.

Steam supplies direct heat to unit heaters (black area) and indirect heat, through four heat exchangers, to 13 individual floor type radiant heating systems (shaded areas), each of which has its own pump.

Radiant heating systems consist of serpentine coils of ¾ inch wrought iron pipe imbedded in the concrete floor.

# Sarcotherm

AN AFFILIATE OF SARCO CO., INC.

4011-B

STEAM, HOT WATER AND RADIANT HEATING

For Radiator Valves, see Sarco ad, page 125

THE MARK OF QUALITY

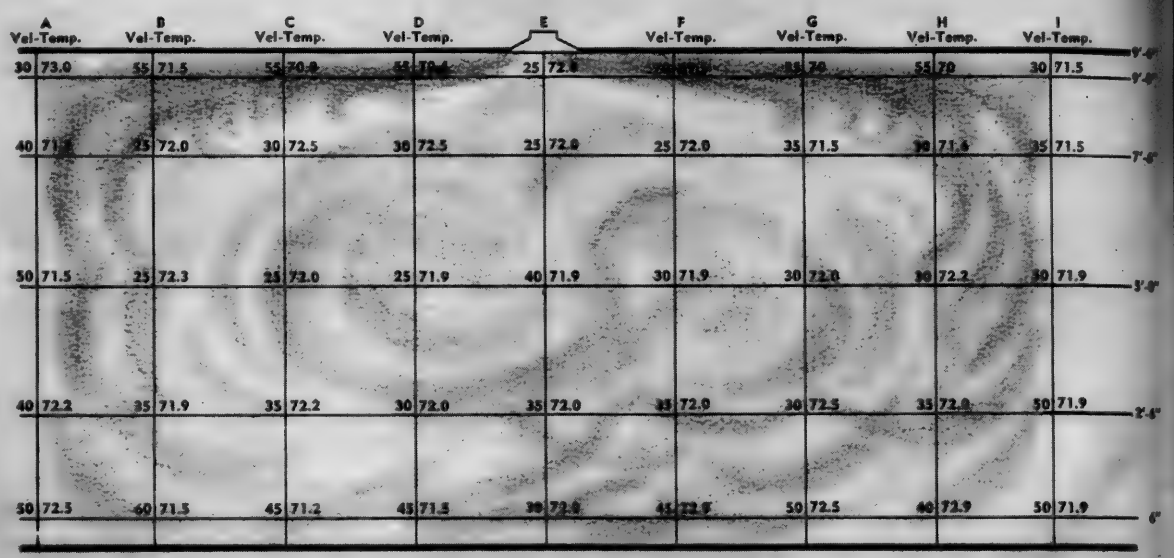
BARBER COLMAN

**Uni-Flo**

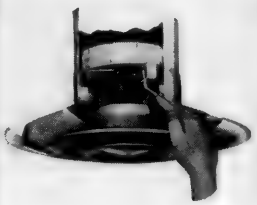
*ENGINEERED AIR DISTRIBUTION*

# get guaranteed performance with Venturi-Flo ceiling diffusers

**BARBER-COLMAN 1020 MODEL JS VENTURI-FLO**
**VELOCITY-TEMPERATURE TRAVERSE THROUGH VERTICAL PLANE**




SUPPLY AIR VOLUME — 545 CFM
SUPPLY AIR TEMPERATURE — 51.8°F
AVERAGE ROOM AIR TEMPERATURE — 72.0°F AT THE 5' LEVEL



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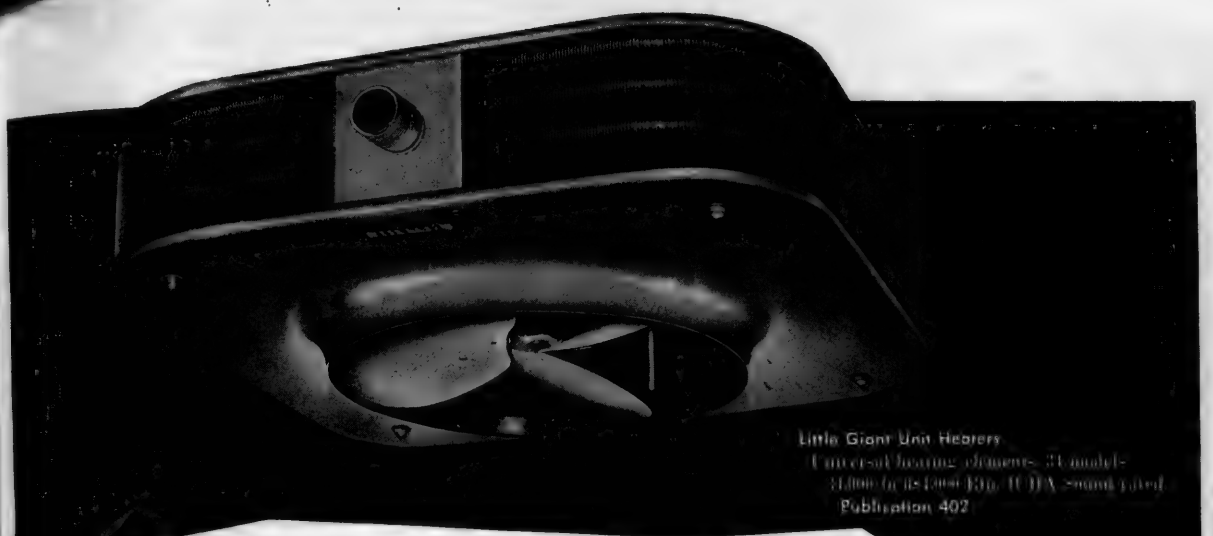

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Universal heating elements—24 models—
15,000 to 335,000 Btu/hr. EDR—propeller fan
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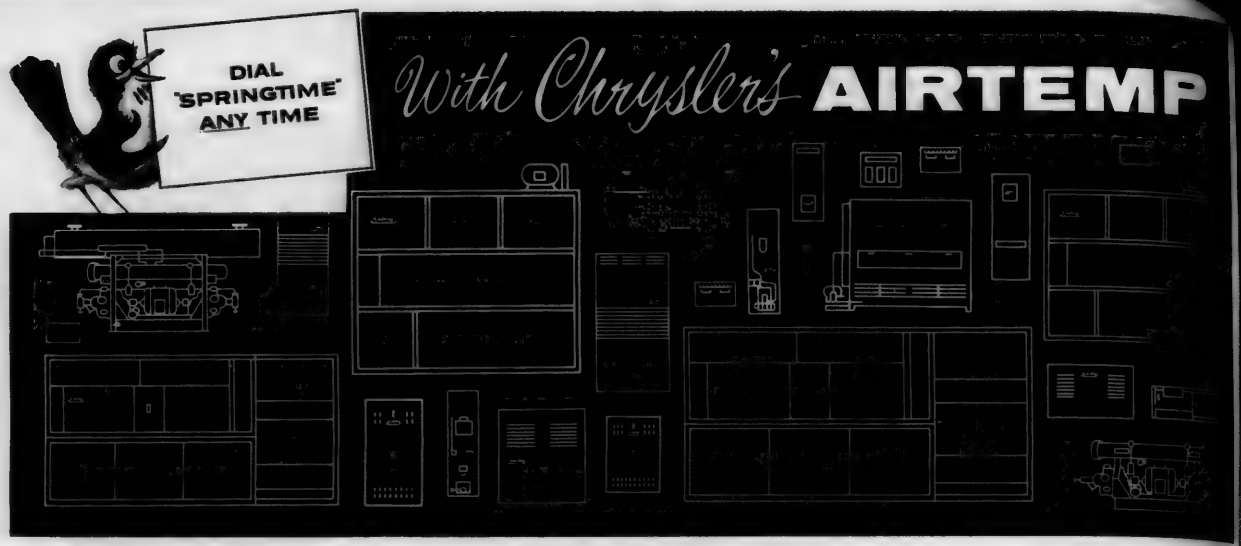


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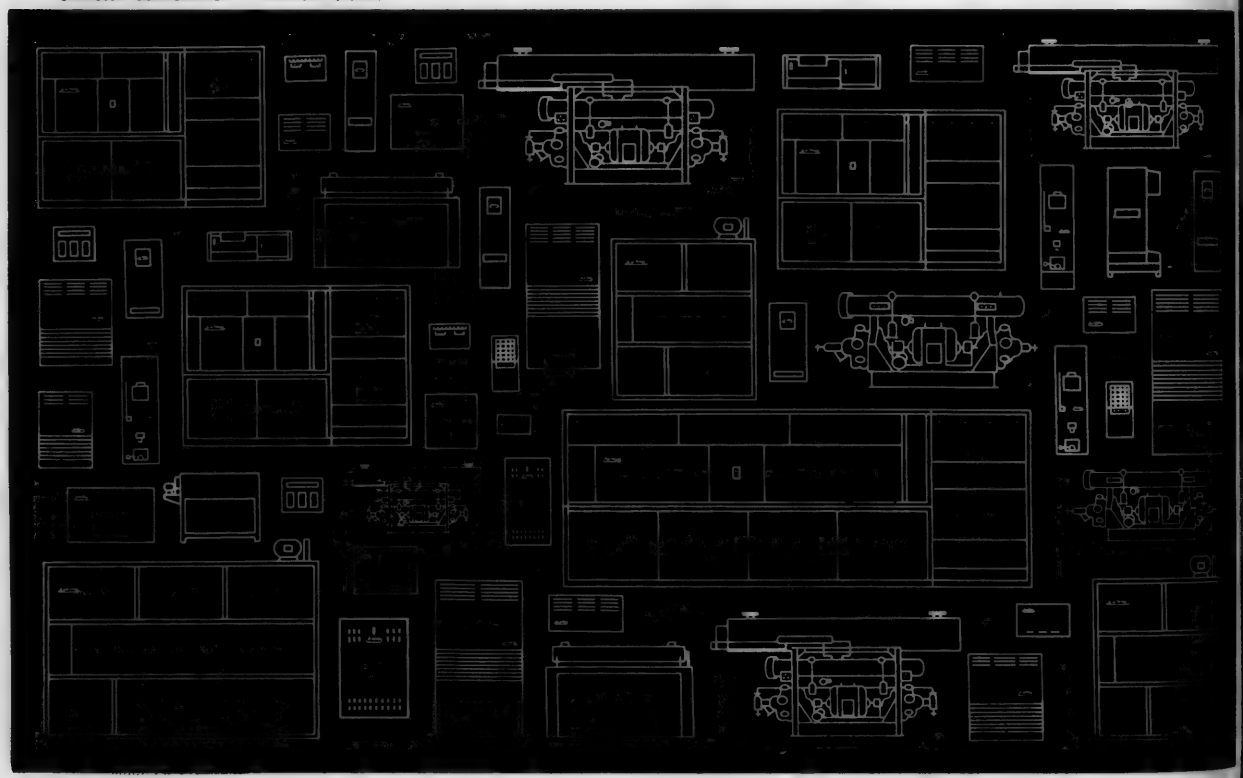

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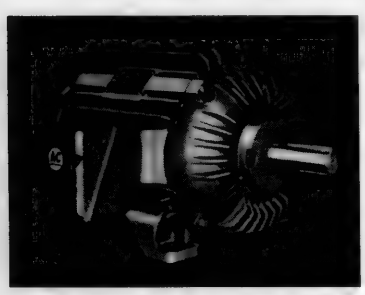

**For specifications** of Allis-Chalmers motors for heating and ventilating service, contact your local A-C distributor or A-C office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

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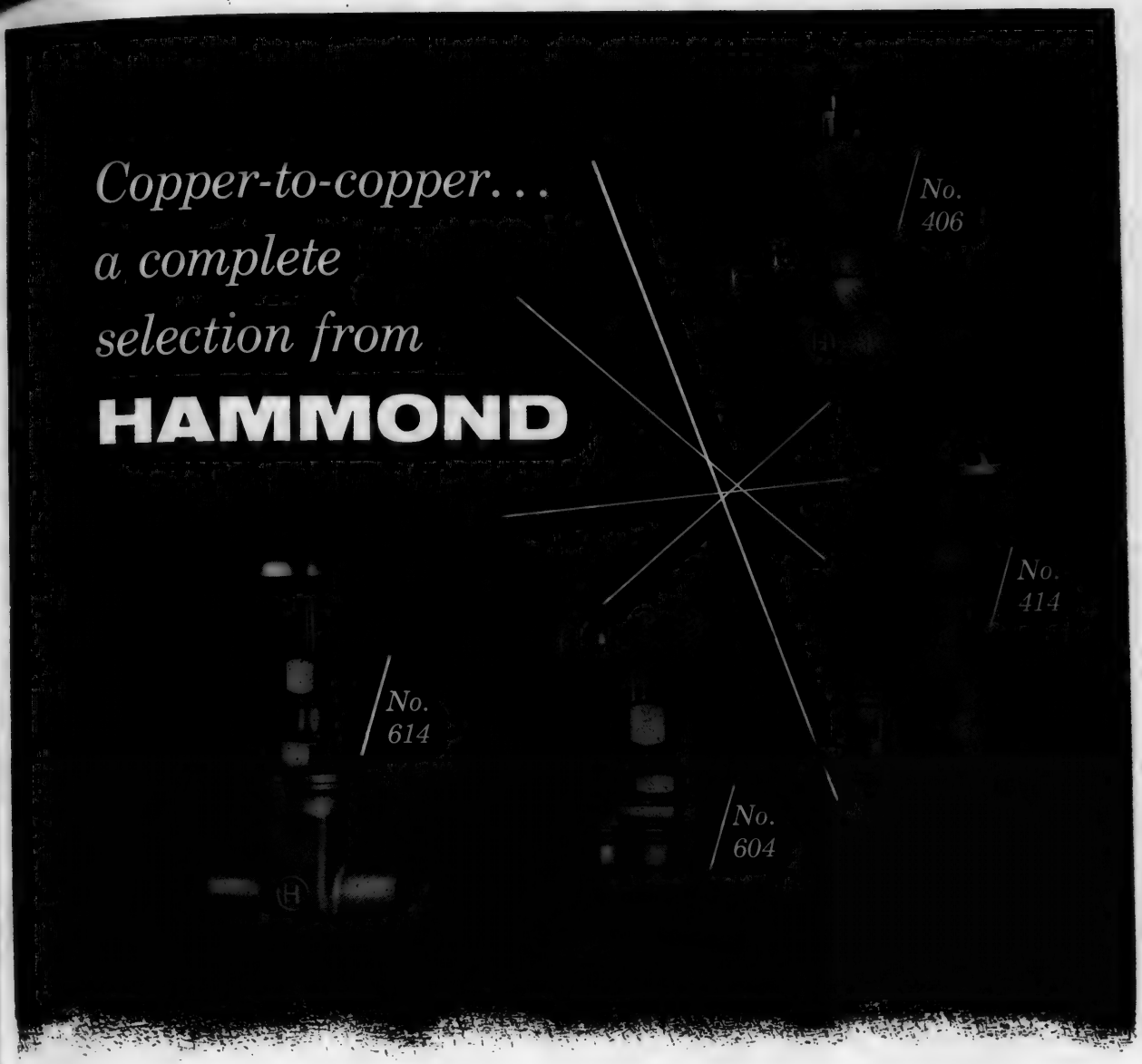


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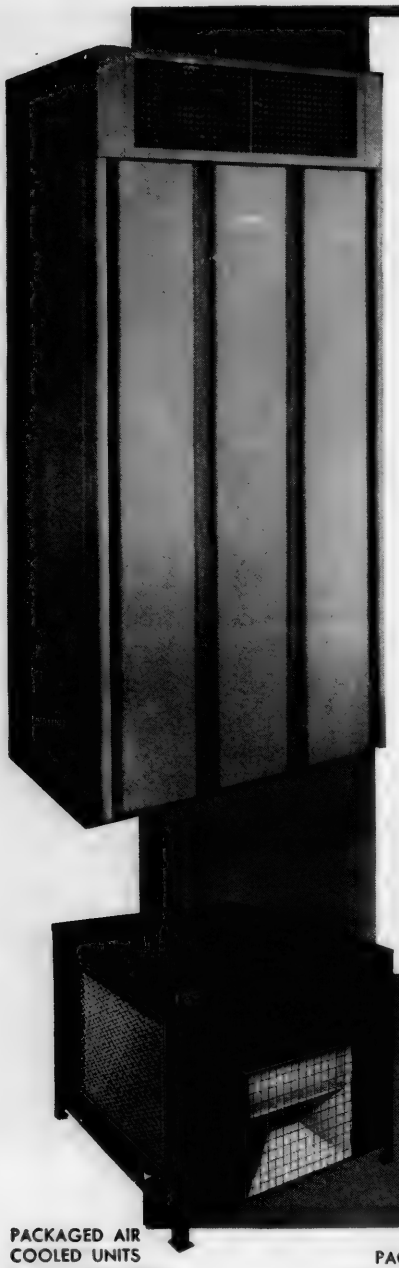

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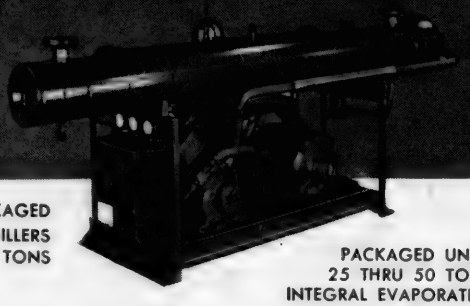

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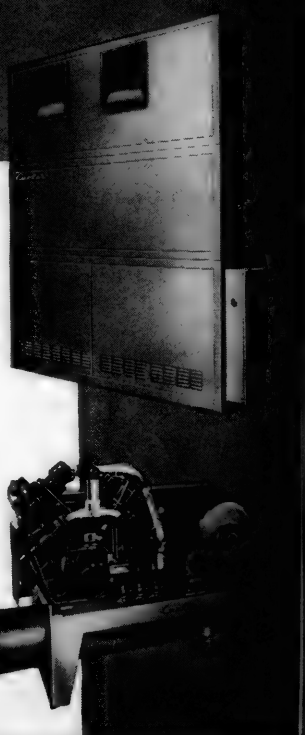

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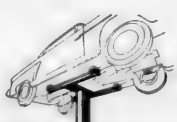
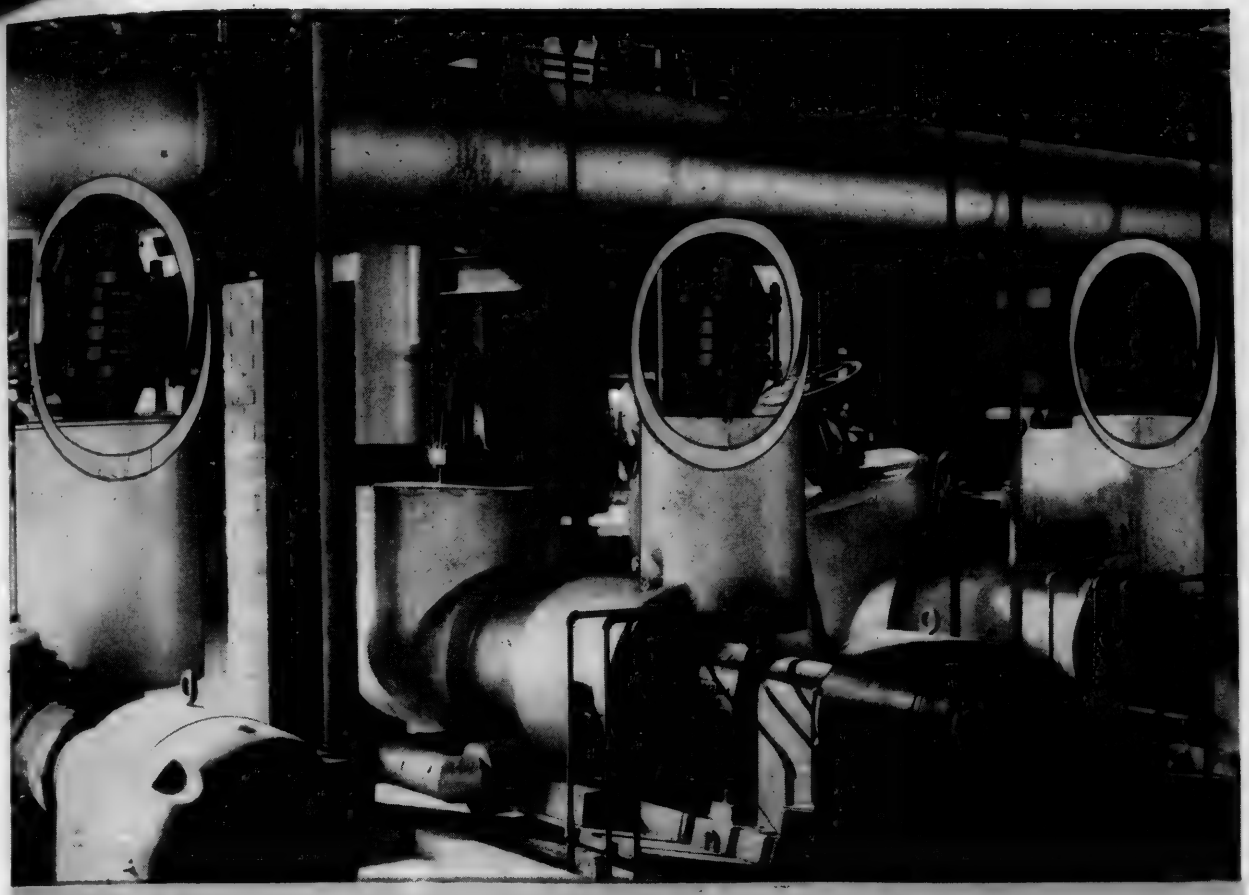


AUTO LIFTS



# ADSCO CORRUFLEX EXPANSION JOINTS SOLVED A PIPING PROBLEM FOR NATIONAL ANILINE

The new $20,000,000 diisocyanates plant of the National Aniline Division, Allied Chemical & Dye Corp., at Moundsville, W.Va., is known for many engineering wonders, especially its miles of intricate piping. The photo above shows three ADSCO Corruflex anti-compression packless expansion joints used to secure satisfactory piping connections between the main piping and three pumps.

If rigid piping had been used to connect the three pumps to the 18-inch main feeder, the piping soon would have been twisted and overstressed by the growth of the main feeder when hot process liquid was pumped through it. National Aniline engineers, in consultation with ADSCO engineers, decided to use the anti-compression joints shown in the photo. These are deflected laterally with minimum strain on the connecting piping and pumps as the main feeder expands or contracts. Also, the joints absorb vibration of the pumps and motors.

For efficient, right-working pipe line arrangements, use ADSCO Corruflex expansion joints. Packless, they require no maintenance. Sizes, 3" to 54"; for temperatures to 1600 F and pressures to 300 psi.

**REMEMBER!** Use ADSCO Expansion Joints instead of Pipe Bends because of these advantages:

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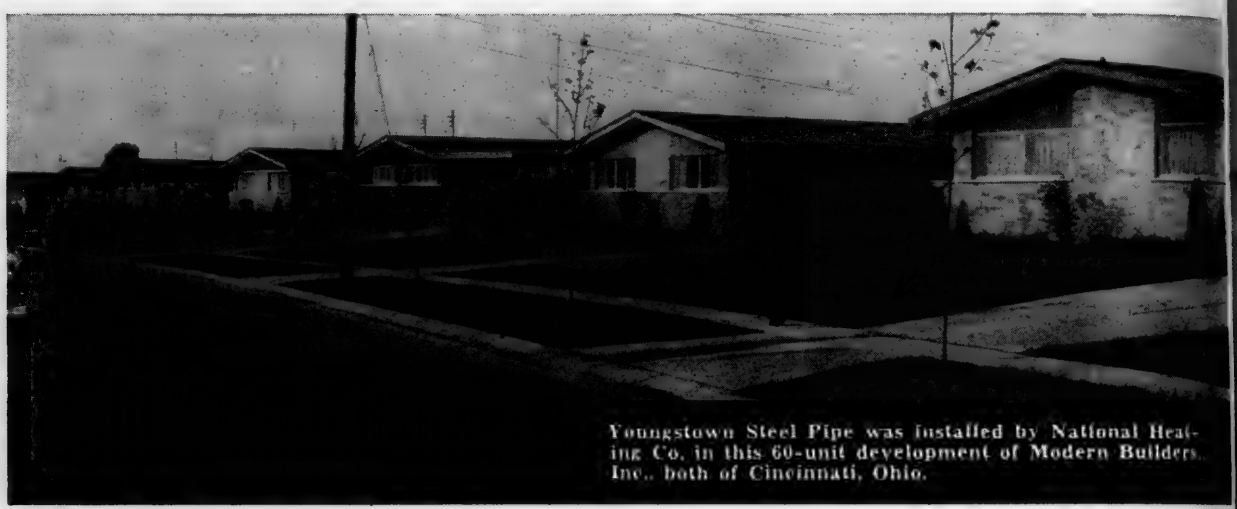
CONSOLIDATED INDUSTRIES, INC.

# Youngstown steel pipe

## . . . Gives Long, Maintenance-Free Life to Radiant Heating Installations



Youngstown Steel Pipe was installed by National Heating Co. in this 60-unit development of Modern Builders, Inc., both of Cincinnati, Ohio.

**Specify Youngstown and secure these 7 Points of uniform goodness**

| | |
|---|---|
| uniform ductility | uniform wall thickness and size |
| uniform lengths | uniform strength and toughness |
| uniform threading | |
| uniform weldability | |

uniform roundness and straightness

Modern residential developments—like this 60-unit project off Cincinnati's Winton Road—demand only the most modern heating facilities. So, to afford these new homeowners warm, draft-free rooms of equalized temperatures, invisible radiant heating systems utilizing Youngstown Steel Pipe were installed.

For years Youngstown Steel Pipe has been specified by leading architects as well as progressive plumbing and heating contractors for its dependability and long life. That's because it's made of only the finest steel by steelmen with over half-a-century of steelmaking knowhow. All Youngstown operations from ore mining to finish threading are closely quality-controlled to give you the best piece of pipe obtainable anywhere. Why not make Youngstown your specification for long, trouble-free installations?

For additional information or service, contact your local Youngstown distributor—or phone our nearest District Sales Office, today.

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**THE YOUNGSTOWN SHEET AND TUBE COMPANY**

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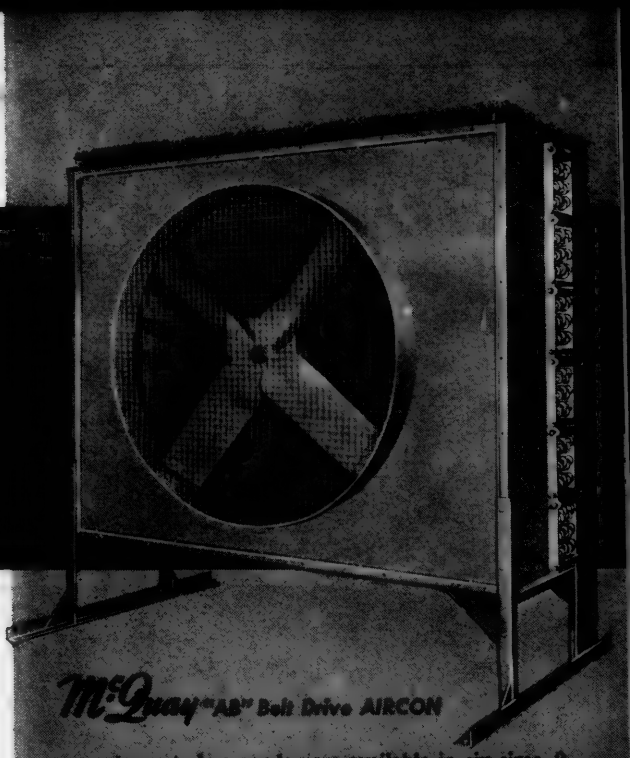

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**for Waterless Refrigeration and Air Conditioning**

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McQuay Aircons are designed in two types—direct drive models for commercial and industrial air conditioning and refrigeration applications, and belt drive models up to 30 tons capacity in a single unit for larger condensing requirements, such as air conditioning and refrigerating supermarkets, shopping centers, office buildings or large industrial plants.

All McQuay Aircons are designed for multiple circuiting, so that two or more separate refrigeration systems can be connected to the same condenser.

**Full Winter Efficiency with McQuay "Seasontrol"**

McQuay Aircons operate at peak performance in winter as well as in summer. The McQuay "Seasontrol" modulates the condenser capacity in accordance with the weather for proper operation at all times.

For best results with waterless air conditioning or refrigeration, look to the McQuay Aircon line of remote air cooled condensers with Ripple Fin coil construction, of course. There is a McQuay representative in every principal city, or write McQuay, Inc., 1619 Broadway St., N.E., Minneapolis 13, Minn.

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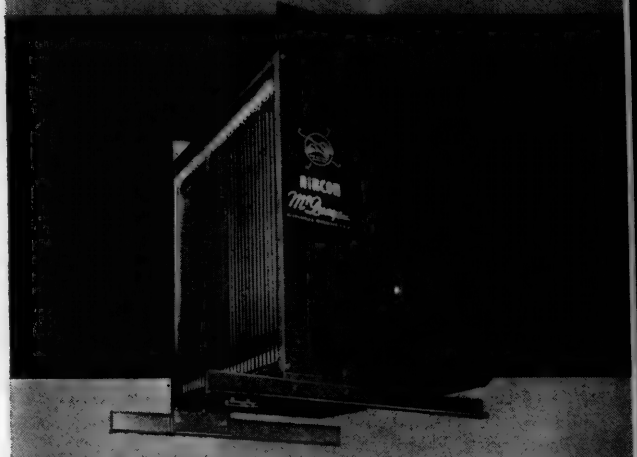
**McQuay "AB" Belt Drive AIRCON**

remote, waterless condensers available in six sizes, 9, 11, 15, 20, 25 and 30 ton nominal capacities in individual units with single fan and motor assemblies. Coils constructed of copper tubes with McQuay Ripple Aluminum Fins. Lifetime ball bearing and slow speed propeller type fan.

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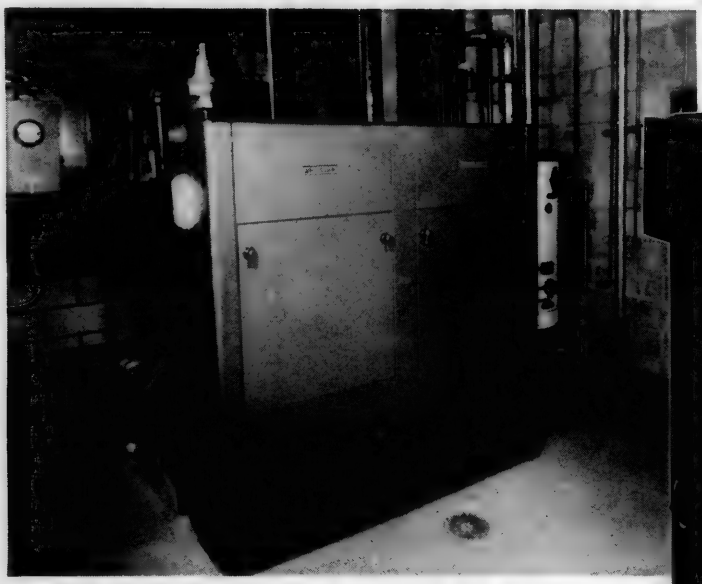
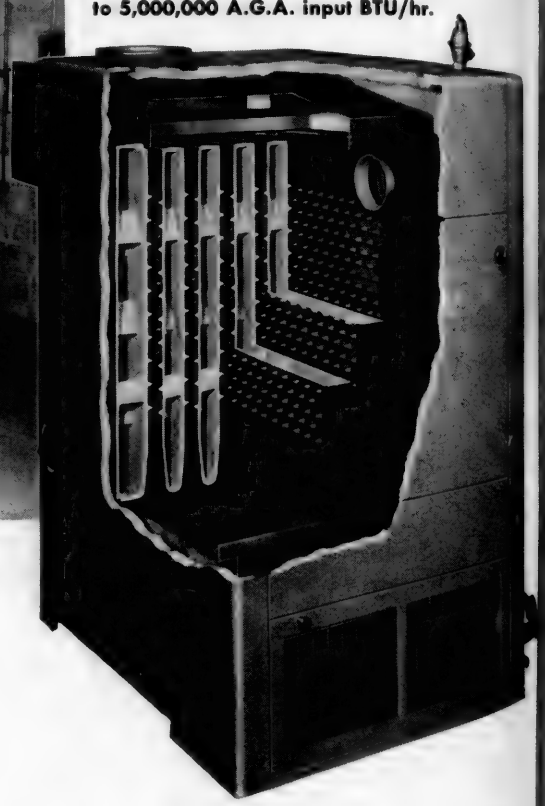


*The Reading Association for the Blind, Reading, Pa., relies on a Weil-McLain Type J Gas Boiler for dependable, economical heating*

**Available in single and multiple units in capacities from 625,000 to 5,000,000 A.G.A. input BTU/hr.**



In this school installation, the Weil-McLain Type J Gas Boiler fully lives up to its reputation as an "extra value" unit.

In the matter of labor, for example, the installing contractor, Walter H. Fritz & Company, West Reading, Pennsylvania, writes—

"Although this was the first J Series Boiler we have ever installed, we found that the erection of it went along very smoothly. Two men did the complete job of installing this boiler. We also found that the jacket supplied with this type boiler fit well without any cutting or alterations of any kind. A final test was made after the complete job was installed and we found the boiler was very efficient."

The Type J Boiler is cast iron—for long life and minimum repairs and maintenance. It is compact in design, requiring less floor space and head room. Assembly with short draw-rods simplifies installation—assures a strain-free assembly. Critical examination of its design reveals construction which develops high efficiency in burning fuel and absorbing heat.

This boiler burns all gases, including LP and LP-air and is equipped with controls for completely automatic, safe operation.

WEIL-McLAIN BOILERS · RADIATORS

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MICHIGAN CITY, INDIANA

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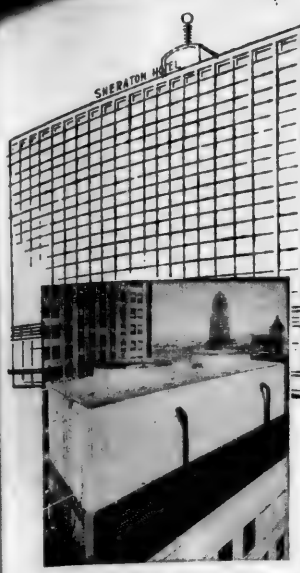


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Marley sales engineers in 55 cities will be happy to show you how designers are making most effective use of Double-Flow Aquatowers, CS (Counter-Flow Steel) and CW (Counter-Flow Wood) models on high-rise and other contemporary construction. Call your local Marley representative today or write for complete information.

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Kansas City, Missouri

MARLEY

# It's a NASH Heating Pump, PLUS

## The type CSI NASH Heating Pump sets a new standard of economy

Now a Nash quality Vacuum Heating Pump can be economically installed and operated on any steam heating job. Engineered for high performance and low installed first cost, this new pump still makes use of time tested Nash principles of operation.

The Nash CSI has generous air capacity and features a wide choice of water capacities and discharge pressures. The right combination of capacities is at hand to match the requirements of the job. It is no longer necessary to pay extra for a pump with excessive water capacity, excessive discharge pressure, or in an attempt to get adequate air capacity.

With this advanced design, Architects, Engineers and Contractors will find answers to many heating system problems. Send for bulletin now.

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2 ECONOMY OF INSTALLATION

3 ECONOMY OF OPERATION

4 ECONOMY OF MAINTENANCE

**NASH** ENGINEERING COMPANY
449 WILSON, SO. NORWALK, CONN.

# SOLAR ENERGY USED TO SUPPLY SERVICE HOT WATER

*(Courtesy, G & L Roofing Co.)*

**Fig. 1. Actual solar water heating installation with storage tank in false chimney.**

E. A. FARBER, W. H. BUSSELL and J. D. BENNETT*

**Data are presented of interest to the designer of a system that uses solar energy for heating water. Figures are given as to the availability of sunshine in the United States, what can be expected from a good solar water heating installation, the effect of multiple glass covers on the absorber, heat losses, how much energy the water can be expected to absorb, and a comparison of the costs of heating water by solar energy, gas and electricity.**

WITH the steady and rather rapid decline of our fossil fuels, it is becoming more and more important that we take a second look at some of the energy sources which have not been used very effectively thus far. One of these sources is solar energy which arrives as sunshine at the earth's surface day in and day out, whether or not we make use of it.

History reports in isolated cases where this source of energy has been used: In defense by setting enemy ships on fire, in science by burning the diamond for the first time, in industry by evaporating ocean water to obtain salt, and by heating water to produce steam for engine drives.

More recently, extremely high temperatures have been produced in the so-called solar furnaces and even electrical energy has been produced directly to operate a rural telephone line at Americus, Georgia.

Among all these uses the heating of water is probably the simplest and most widespread. Even in the United States, where fossil fuels are rather cheap and abundant, solar energy is being used in the southern states to supply hot water to homes, apartment buildings, hotels, restaurants and even some industry. The greatest number of solar water heaters are found in homes and these are primarily the ones to be discussed.

## Solar Water Heating Systems

All solar water heating systems have an absorber, which when exposed to the sun will take in a portion of the energy falling upon it which it converts and supplies to the water as heat. Sometimes water heated in this manner is stored in the absorber but more frequently in an insulated storage tank where it is kept until needed.

In rural Japan and Russia many units are found which consist simply of a flat pan of water with a glass cover. Water is heated when the sun shines into these pans where the glass transmits the sun's short wave radiation but does not transmit the long wave radiation given off by the hot water.

* From left to right, professor and research professor of mechanical engineering; assistant professor, mechanical engineering department; instructor, mechanical engineering department, all with the University of Florida, Gainesville, Fla.

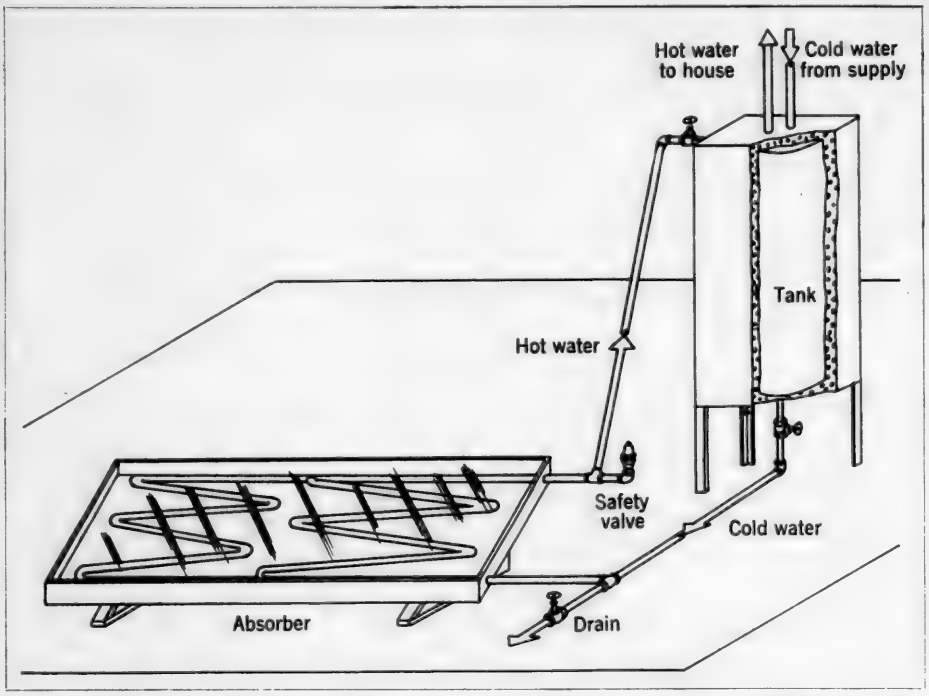


Fig. 2. Typical solar hot water system as found in the United States.

Most absorber elements which feed hot water to a storage tank consist of flat plates, ducts, or more commonly tubes (often fastened to sheets) through which the water circulates. Since the water is completely enclosed, these absorber units are usually inclined toward the sun to be exposed at a more favorable angle. This arrangement is often put into an insulated box with one or more glass covers.

A number of other designs are used in different parts of the world but since they are not so common, they are not discussed here.

In the United States the solar hot water systems, Fig. 2, are of the sinusoidal tube type with a separate storage tank. Copper tubes are soldered to a copper sheet and this combination, painted with a good absorbing paint is put into an insulated box with one or more glass covers as shown in the illustration. The tubes often form parallel circuits to reduce the flow resistance be-

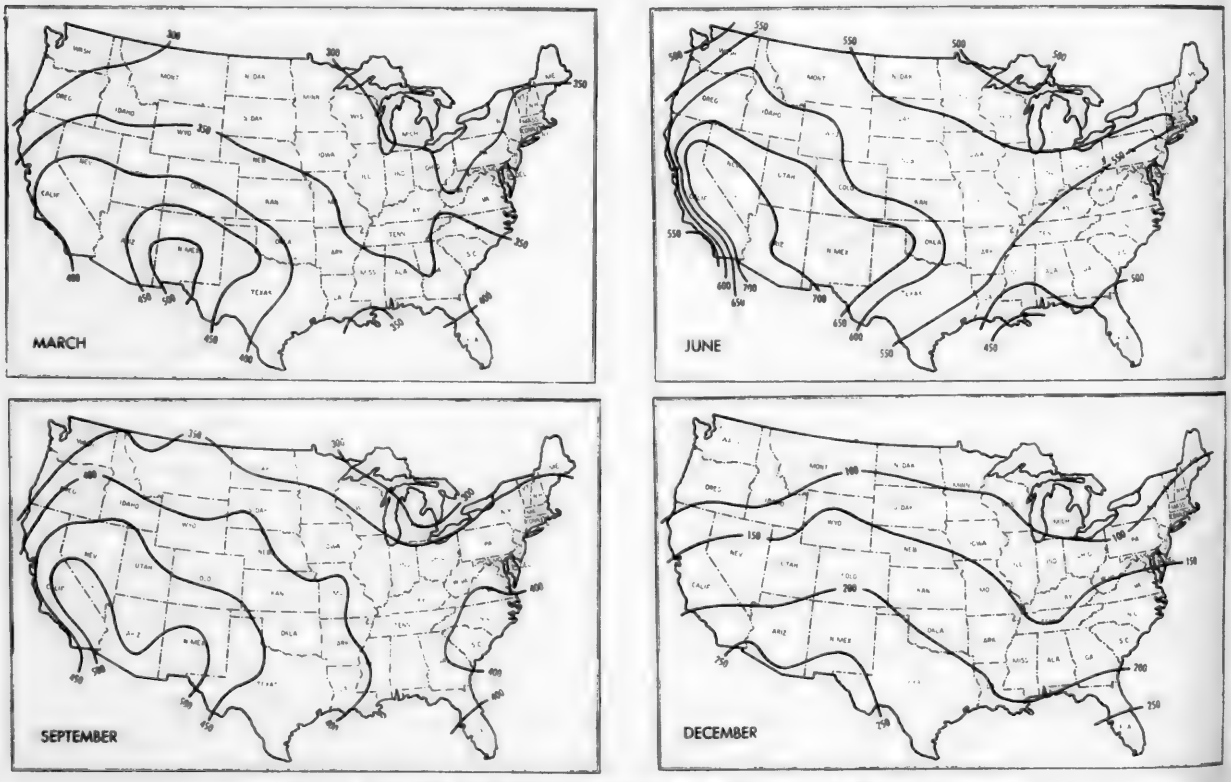


Fig. 3. Actually available solar energy on a horizontal, flat surface.

cause the circulation in the system depends upon the free convection forces produced by the density difference of the hot and cold fluid. The circulation is better, the higher the storage tank is placed above the absorber, but having the storage tank above the absorber poses a problem since in many installations the absorber unit is on the roof of the house. In these cases, the storage tank is often made into a false chimney, Fig. 1.

If one would like to use a circulating pump, the tank could naturally be placed lower than the absorber. In Israel some installations use a small solar pump to give this advantage.

A number of different and newer ideas have been incorporated in some of the solar hot water installations but have not yet been used in large enough numbers to have given conclusive performance information.

Some of the units use a dual circulation system which have a more efficient and cheaper absorber unit, but they require a heat exchanger. Their main advantage is that they can be protected from damage by freezing through antifreeze solutions in the primary circuit. The conventional system in the United States has to be drained on nights when the water in the absorber might freeze. This is one reason why these solar hot water installations are not found where frequent frosts occur. It is possible to devise a thermostatically operated system for the water supply to drain the water automatically from a solar energy absorber when the temperature drops to near freezing. This would, however, add to the cost of installation.

## Availability of Solar Energy in the United States

In considering the use of solar energy for the heating of water, it is important to know just how much energy is available for possible use. While not all of this energy can be used, it does impose an upper limit.

Figure 3 shows the actual availability of solar energy for March, June, September and December. These data[1] comprise averages over the last 20 years, and present the average amount of solar energy falling upon a flat, horizontal surface. The energy available on a clear day will, of course, be much greater.

The values in Fig. 3 are given in Langleys per day and can easily be converted into Btu per square foot per day when multiplied by 3.69.

Data of this kind are recorded continuously by many stations reporting to the Weather Bureau in Washington, D. C., and published monthly.[2]

## Design Considerations

Knowing the amount of solar energy available at a particular location, its feasibility for water heating can be investigated. Here the best arrangement of a conventional design, Fig. 1 and 2, which can be purchased directly, is taken for the analysis.

*Orientation of the absorber.* The question of how much solar energy can be intercepted is of utmost importance in evaluating the heating of water. From Fig. 3 the amount falling upon a flat, horizontal surface is obtained. It is easy to see that a surface which would always point at the sun would receive considerably more sunshine. However, the mechanism to make the absorber follow the sun would be very expensive and therefore not practical for widespread use.

Thus, the best stationary arrangement will be considered. Since the sun is in a southerly direction most of the day, it is best for the absorber to face due south. Since the days are shorter and the air temperatures lower in winter, it is more difficult for the absorber to deliver the required amount of hot water during this season, while in summer it is usually capable of delivering a considerable excess. For this reason it is found that the best all year around performance is obtained with the stationary absorber facing due south, when it is inclined with the horizontal approximately 10 deg more than the local geographic latitude.

The amount of energy falling upon a surface oriented in this manner can be obtained from Fig. 4, which gives the relationship of energy falling upon this surface as compared to that on a horizontal surface (Fig. 3). Data for different latitudes and different times of the year are given.

*Effect of number of glass covers.* Glass covers on the solar absorbers transmit a considerable portion of the short wave radiation coming from the sun but reflect

[1] Fritz S. and MacDonald, T. B., Average Solar Radiation in the United States, Heating and Ventilating Vol. 46, No. 7, July 1949.
[2] U. S. Weather Bureau, Department of Commerce, Solar Radiation Data, Climatological Data, National Summary, Published monthly.

Dr. Erich A. Farber, professor and research professor of mechanical engineering, University of Florida, was born in Vienna, Austria. He obtained a considerable amount of his education in Europe, and holds degrees from the University of Missouri and a Ph.D. from the University of Iowa. He has taught physics, mathematics and engineering at the universities of Missouri, Iowa, Wisconsin and Florida. His main fields of interest are heat transfer, fluid flow and thermodynamics which has led him into the field of nuclear energy and into the solar energy field. He is secretary of the Solar Energy Applications Committee of ASME and director of solar energy work at the University of Florida which is in the process of building a solar energy laboratory. He is consultant to the Oak Ridge National Laboratory, a number of government agencies and industries. He has written a number of papers on solar energy.

W. H. Bussell, assistant professor, mechanical engineering department, University of Florida, was born in Rochelle, Ga. He received degrees of Bachelor of Mechanical Engineering and Master of Science in Engineering from the University of Florida. He was an instructor at the University of Florida and then was employed by the U. S. Forest Service as a mechanical engineer. He is a registered professional engineer and has been associated with solar energy work at the university for several years.

J. D. Bennett, instructor, mechanical engineering department, University of Florida, received from that university his Bachelor of Mechanical Engineering in 1953 and his Master of Science in Engineering in 1956. His graduate thesis was on the performance of a cylindrical parabolic solar absorber and since his graduation he has been associated with solar energy work at the university. He is a member of the honorary engineering fraternity, Sigma Tau and the social fraternity, Sigma Chi.

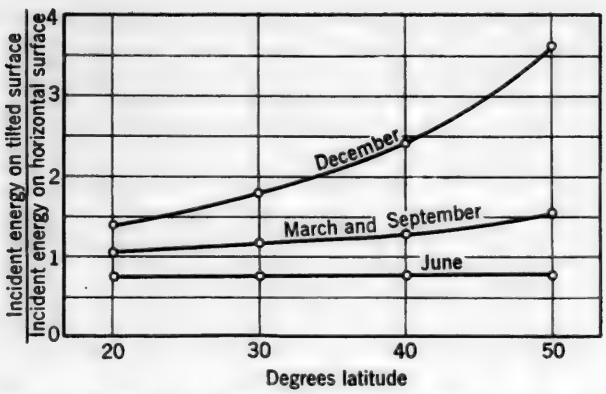


**Fig. 4. Conversion factor to determine the amount of solar energy falling upon a surface facing due south and inclined 10 deg more than the local geographic latitude for different times of the year.**

**TABLE I—DAILY SOLAR ENERGY TRANSMISSION**

**As a Function of the Number of Glass Covers**

| Number of Glass Plates | Transmission Coefficient |
|---|---|
| 0 | 1.0 |
| 1 | 0.748 |
| 2 | 0.625 |
| 3 | 0.542 |
| 4 | 0.474 |

some, especially at low angles of incidence. The long wave radiation, from hot surfaces of the absorber, is only transmitted to a very small degree. Clear, untinted glass is the best since constituents like iron (greenish tint on the breaking edge), reduce the transmission of short wave radiation.

The amount of solar energy transmitted through the glass depends greatly upon the angle at which the sun rays hit the glass, which naturally varies continuously all day long. The greater the angle between the glass and the sun ray, the better. When more than one glass plate is used, the amount of energy transmitted is further reduced but at the same time the heat losses from the top of the absorber box are reduced since the air layers between the glass plates have good insulating qualities.

Table 1 shows how the number of glass covers effects the energy transmitted as a fraction of the amount falling upon the glass per day (transmission coefficient).

Figure 5 indicates the insulating qualities of the glass layers in terms of actual losses from a typical absorber. It can be seen that the increase in savings becomes less with each additional sheet of glass.

Combining the information of Table 1 and Fig. 5, it can be seen that there exists an optimum number of glass plates. The standard absorber for which the data are presented here delivers water at about 130 deg F with an average temperature difference between the heated water and the air of about 75 deg F. Figure 6 clearly points out this optimum number of glass plates which will collect the maximum amount of solar energy.

*Absorber size and design.* It is not always possible to choose the best technical design, and often it is necessary to compromise. This compromise between cost, convenience and available space for a unit will determine the actual final design. The available materials, geographic location and weather conditions also play an important role. Many times a poorer system is chosen as long as it still delivers the amount of hot water required. The most common design in the United States uses only one glass cover and for an average family of four measures 4 ft by 14 ft.

For larger families, apartment buildings and restaurants, several of these fundamental units are connected in parallel.

*Storage tank size and location.* The most common fault of solar hot water installations is inadequate storage. If the hot water stored is used up, no more can be obtained until the sun shines again. If the tank is too small, once the water is hot, circulation between the absorber and tank will stop and the system becomes inoperative until some of the hot water is used.

Data indicate that the average person uses about 20 gal of hot water per day, so for a family of four, 80 gal of hot water should be stored for a 24-hour period, requiring an 80 gal tank. If bad weather is expected, this storage capacity should be increased or a fuel booster added. Even on cloudy days (and that is shown in the data of Fig. 3) a considerable amount of solar energy is collected thus not requiring too large a reserve.

To provide good circulation without a pump, the tank must be above the absorber with the lines from absorber to tank short. The tanks are often concealed in the attic or a false chimney on the roof.

*Other considerations.* The materials readily available and their cost are important, as well as is the existing structure where the solar hot water system is to be installed—that is, whether there is available a roof facing south having a good slope, or a flat roof. Sometimes the absorber can be installed on the ground or above windows or a door, like an awning, with the storage tank on the roof, in an attic or in a closet.

If frost may occur, provisions must be made for easy drainage of the unit to prevent damage from freezing.

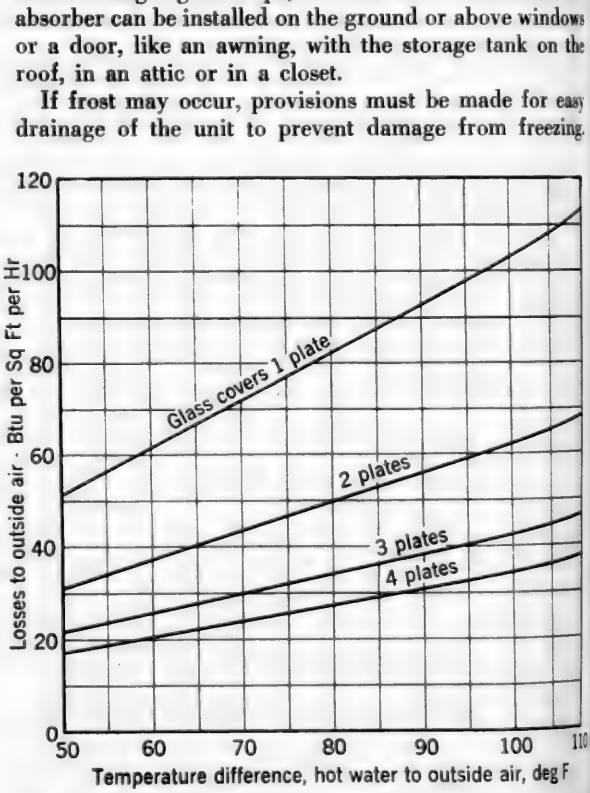
Losses to outside air - Btu per Sq Ft per Hr
Glass covers 1 plate
2 plates
3 plates
4 plates
Temperature difference, hot water to outside air, deg F

**Fig. 5. Insulating quality of different number of glass covers in terms of losses from a typical absorber.**

If the installation is not intended to supply all the hot water needed, a booster can be added or two systems can be combined.

Dual circulation systems have been developed to prevent frost damage. Money saved in the construction of the cheaper, low pressure absorber can be used on the heat exchanger, which is necessary, without increasing the overall cost.

Some new materials have been developed recently like Revere's "tube in strip" material which can be expanded hydraulically; some plastics which have even better solar properties than glass, and will be used in the near future to decided advantage.

## Economic Analysis and Cost Comparison

Whether solar water heating is economical and advantageous in a particular case will depend upon many factors. The most important ones are:

1. Amount of available sunshine
2. Availability and cost of fossil fuels
3. Cost and design of solar water heating installation
4. Length of intended use of the system

From these points it can be seen that the best place for a solar water heating system is where sunshine is abundant and other fuel sources unobtainable or very expensive. It so happens that many areas of the world, and even in the United States, which are poor in fossil fuels have an abundance of sunshine. These areas are furthest advanced in the use of solar energy.

In many areas, such as Spain and South America, very cheap installations like pipes placed on the roof have sometimes proved satisfactory. A number of solar water heaters in the Miami area which were damaged by storms (the glass broken) are working without the glass, apparently to the satisfaction of the owners, and have therefore not been repaired.

A study of the cost of a purely solar system, a solar system with a manual booster and one with an automatic booster are compared in Fig. 7 with gas and electric hot water systems.

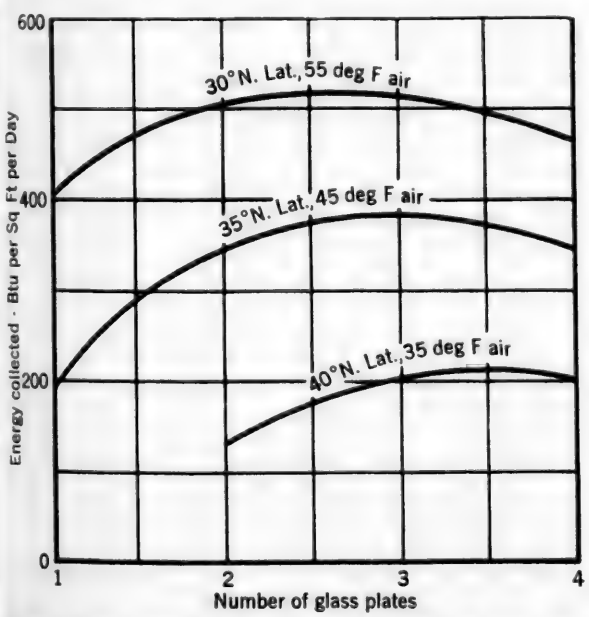


Fig. 6. Solar energy collected by a typical collector for a typical day showing the effects of number of glass plates, latitude and air temperature.

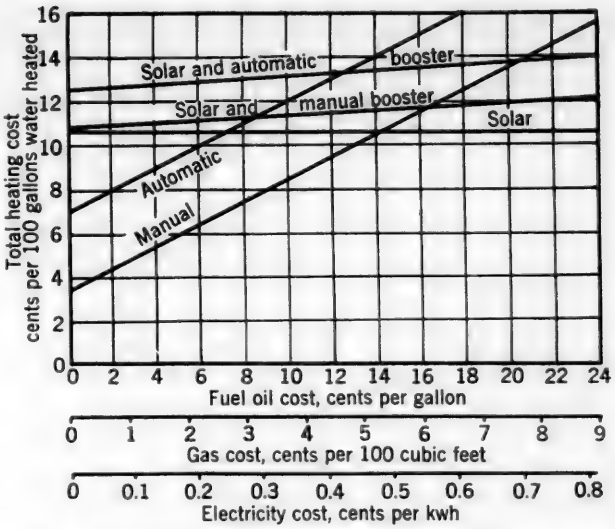
Total heating cost cents per 100 gallons water heated
Solar and automatic booster
Solar and manual booster
Solar
Automatic
Manual
Fuel oil cost, cents per gallon
Gas cost, cents per 100 cubic feet
Electricity cost, cents per kwh

Fig. 7. Economic comparison of different commonly used water heating methods (system and installation cost spread over 10 years).

From this figure which applies to Florida specifically, the most economic method can be selected once the cost of the different systems, installation and fuels are known. These figures are based upon a 10-year unit life.

The last important factor mentioned is the time, or how long a hot water system is to be used. From the builder's point of view, the solar hot water system is the least economical system since the initial cost is higher than for the other systems and, after all, the buyer is going to supply the fuel. If, however, one plans to live in a house a few years, serious consideration should be given and a comparison of the different systems and methods be made. After a certain period, the cost of a fossil fuel heater (initial cost plus fuel) will have cost as much as a solar heater. From then on the solar heater furnishes the hot water free, while the fossil fuel heater has to be supplied with additional fuel. This break-even point varies depending upon the particular household, geographic location, weather conditions and fuel prices. For Florida this has been found to be about three years.

## Summary and Closure

Using this information, it is easy now to analyze a particular situation, a proposed or existing solar hot water system. From Fig. 3 the amount of sunshine available at a certain location can be found. This is an average value and many days much more will be available. Figure 4 relates these figures to the amount actually falling upon a favorably located and oriented surface. Table 1 gives the fractional amount actually getting to the absorber through the glass covers. Figure 5 shows what losses can be expected from a typical absorber at reasonable operating conditions. Combining the information from Table 1 and Figure 5 as presented in Figure 6 shows that there exists an optimum number of glass covers for an absorber. And finally, Fig. 7 gives an economic comparison between different commonly used water heating methods.

The most economical method can be selected therefrom.

# Five Simple Ways to Reduce Boiler Fuel Costs

E. E. FINN
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REGARDLESS of the fuel being used, the best and most over-looked place to begin smoke control and efficient utilization programs is in the boiler room.

This statement is based on more than 100 plant surveys, where I found surprisingly often that five basic rules for efficient boiler operation are being over-looked. As a result, fuel is being wasted as smoke, and smoke causes air pollution.

With little effort and no cash outlay, considerable fuel economy and reduction of air pollution can be achieved in most boiler rooms.

Here are five reasons why boiler rooms waste money and cause air pollution:

### 1. Air-Bound Boiler Room

A typical case is a school that had been converted from the use of bituminous coal which caused a smoky condition, to No. 5 oil. But the oil still smoked, and a further complication was noticed. The floor above the boiler room vibrated so much that it could not be used.

The first thing I did, while accompanying the school chief engineer, was to hold a lighted paper near the boiler room door opening. When I opened the door, the lighted paper was blown out.

The boiler room was fighting for air. By opening two windows, I solved three problems: (1) the floor above the boilers stopped vibrating; (2) fuel waste was halted; (3) and the smoke stopped.

A permanent air supply was guaranteed by installing a sheet metal air duct from a window to within 2 ft of the boiler room floor.

Another case of air miserliness was found in a New Jersey school. When three No. 4 oil burners were started at the same time, the smoke-alarm bell always sounded—or tried to sound, because the bell had been stuffed with paper so as not to bother the fireman. Here again was a case of air starvation. When I opened the cellar doors and let in enough air for the burners, the smoke alarm bell stopped ringing. Once more, a simple air duct was the answer to a vexing problem.

### 2. Proper Cycle Operation

Any burner—oil, gas or coal—should be "on" for long periods and "off" for short periods. Though this may seem contradictory, the proper balance of long "on" and short "off" will give maximum fuel economy and eliminate smoke. Statistics show that boiler output will reach 97% of rated capacity with 15 minutes "on" and 3 minutes "off," whereas the output drops to 63% with a cycle of 15 minutes "on" and 75 minutes "off."

### 3. Sequence Control for Two or More Boilers

A central heating plant with three boilers was emitting smoke and causing embarrassment to a city official, who was trustee for that particular block. The first thing I noticed, after being invited to check the layout, was that even though chimney draft was limited, all three boilers were started simultaneously. This meant that while maximum draft was called for, it was not available.

Simply by varying the pressure controls so each boiler pressure was one pound apart, only one boiler went on at a time and carried the load as long as possible. Then, when the load demanded, the second boiler went on—and the chimney would be warm. With only one boiler coming on at a time, the existing draft was ample and the smoke problem disappeared.

I encountered a similar but more serious situation in a New Jersey school. It was heated by three dead-plate bituminous coal stokers, which smoked badly.

In addition to smoke, coal gas was such a problem that twice it was necessary to close school. The school board had almost decided to convert to oil. As soon as sequence controls were installed, complaints stopped.

### 4. Importance of Draft

While a shortage of air can cause smoke, too much cold air can produce the same result. Excess cool air chills a boiler below proper operating conditions and causes smoke when the boiler is turned on.

An example of cold air plus cold fuel was found in a large Central New York school which burned No. 5 oil in four boilers. Though only two boilers were needed at any one time, the third and fourth boilers were kept on the line with secondary dampers wide open. Thus, the second two boilers acted as condensers.

Contributing to the over-burdened draft supply was an incinerator whose breeching was connected at right angles to the main breeching. This arrangement caused such turbulence that the main boilers smoked.

As soon as the angle of the incinerator breeching was changed from to 90 to 45 degrees, the turbulence (and smoke) was reduced.

### 5. Importance of Proper Custodian Training

Though boilers represent a large investment, many purchasers do little about training custodians so they can achieve top operating efficiency. When boilers are first installed or replaced, the custodian should be given a thorough indoctrination course. Later as service calls are made, the custodian should understand what corrections are done by the repairman.

While anthracite and coke cannot be made to smoke, greater combustion efficiency and economy will result from following these five points. If oil-fired boilers are checked against these five points, fuel costs and smoke problems will be reduced.

# FUEL EQUIVALENT CHART

The purpose of the accompanying fuel equivalent chart, designed by C. C. McRae, is to determine the quantity of one fuel burned at a given efficiency equivalent to another fuel of different type, of different efficiency, and in different quantity units. That is, the chart is a solution of the equation:

$$X = \frac{M \times H_m \times E_m}{H_x \times E_x}$$

where $X$ = required equivalent;
$M$ = quantity of known fuel;
$H_m$ = heating value of known fuel;
$E_m$ = operating efficiency of known fuel;
$H_x$ = heating value of required equivalent; and
$E_x$ = operating efficiency of required equivalent.

The efficiencies are to be expressed as a decimal. The resulting answers, just as on a slide rule, do not indicate the position of the decimal points.

Table 1 is to assist in determining the location of the decimal point. To use Table 1, note that, first column of figures, 1 ton of coal at 100% efficiency is equivalent to 164 gal. of 152,000 Btu oil, 172 gal. of 145,000 Btu oil, 21,700 cu. ft. of 1150 Btu natural gas, 29,412 cu. ft. of 850 Btu per cu. ft. gas, 45,454 cu. ft. of 550 Btu per cu. ft. gas, and so on. To apply the table and use the chart, refer to the following examples:

**Example:** For a given process 9.5 gallons of diesel oil (145,000 Btu per gal.) are burned at an estimated 60% efficiency. How much 1150 Btu per cu. ft. natural gas will be required for this process if burned at 70% efficiency?

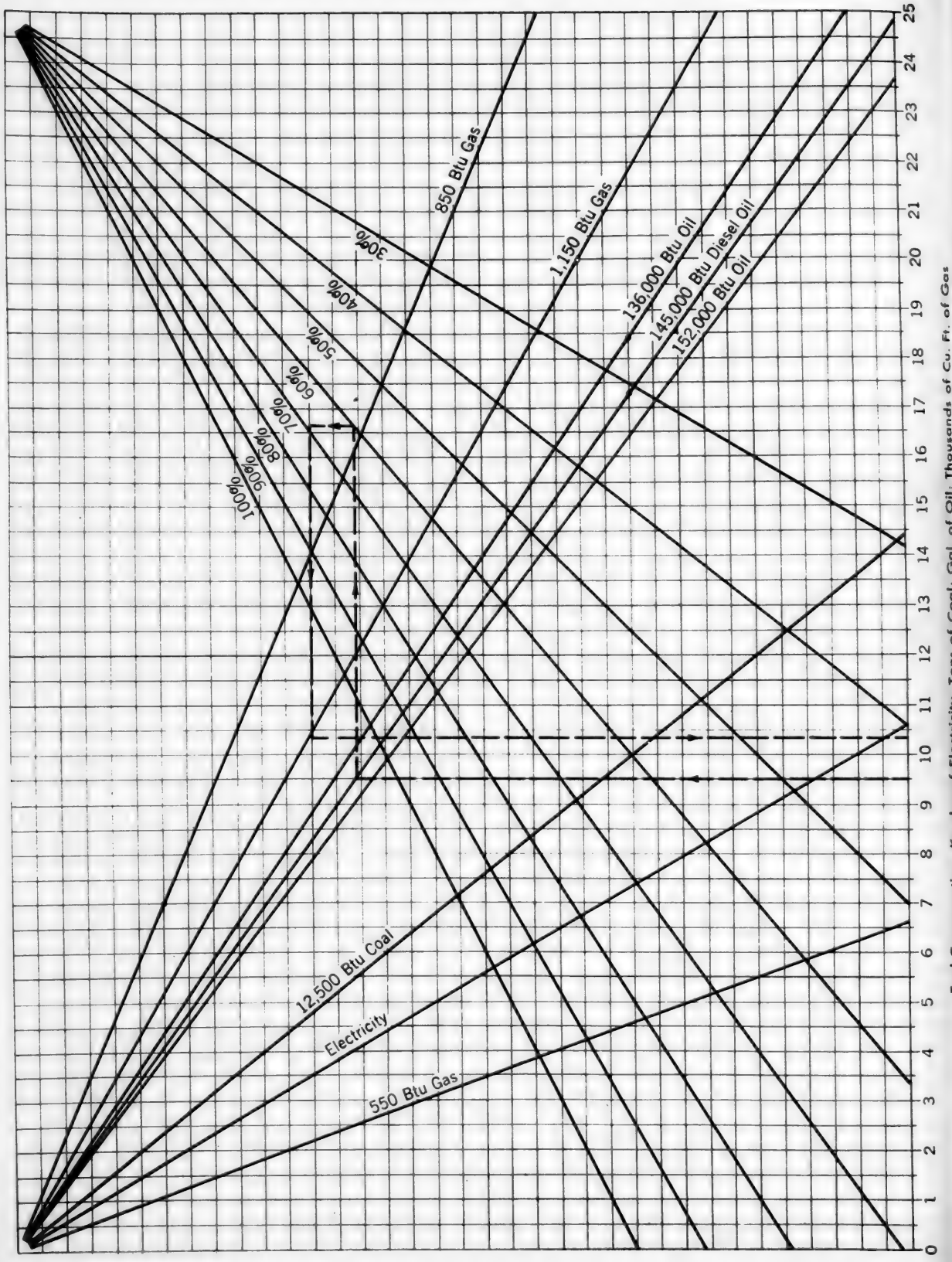
**Solution:** Locate 9.5 on horizontal scale, move vertically to the diesel oil curve, horizontally to the 60% efficiency curve, vertically to the 70% curve and horizontally to the 1150 Btu natural gas curve, thence downward and locate 10.3 M cu. ft. or 10,300 cu. ft. uncorrected for decimal place. From Table 1 note that 1 gal. of 145,000 Btu per gal. oil is equivalent to 126 cu. ft. of natural gas at 100% efficiency so that 10 gal. is equivalent to 1260 cu. ft.; therefore the answer is 1030.0 cu. ft.

**Example:** A 60% efficiency coal system burning 52 tons of 12,500 Btu per lb. coal is to be replaced by a 70% efficiency system burning 136,000 Btu per gal. oil. How much oil will be required?

**Solution:** Ignoring decimal points, move upward from 5.2 on the horizontal scale to the coal curve, horizontally to the 60% curve, vertically to the 70% curve, horizontally to the 136,000 oil curve thence down and read 815 gal., uncorrected for decimal point. From Table 1, each ton is equivalent to 184 gal. so 50 tons would be equivalent to approximately 9000 gal. at 100% efficiency, so that the answer is 8150 gal.

**Table 1. — Approximate Equivalents, Based on 100% Efficiency, For Determining Position of Decimal Point**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tons of 12,500 Btu per lb. coal | 1 | | | | | | | |
| Gallons of 152,000 Btu per gal. oil | 164 | 1 | | | | | | |
| Gallons of 145,000 Btu per gal. oil | 172 | 1.05 | 1 | | | | | |
| Gallons of 136,000 Btu per gal. oil | 184 | 1.12 | 1.07 | 1 | | | | |
| Kilowatt-hours of electricity | 7327 | 44.5 | 42 | 40 | 1 | | | |
| Cubic feet of 1150 Btu per cu. ft. gas | 21700 | 132 | 126 | 118 | 2.97 | 1 | | |
| Cubic feet of 850 Btu per cu. ft. gas | 29412 | 179 | 170 | 160 | 4.02 | 1.35 | 1 | |
| Cubic feet of 550 Btu per cu. ft. gas | 45454 | 276 | 264 | 247 | 6.20 | 2.09 | 1.55 | 1 |


850 Btu Gas
1,150 Btu Gas
136,000 Btu Oil
145,000 Btu Diesel Oil
152,000 Btu Oil
30%
40%
50%
60%
70%
80%
90%
100%
12,500 Btu Coal
Electricity
550 Btu Gas
0
1
2
3
4
5
6
7
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25
Fuel Consumption: Kw.-hr. of Electricity; Tons of Coal; Gal. of Oil; Thousands of Cu. Ft. of Gas

## Safe Design and Use of

# Spray Booths With Paint Filters

SIDNEY MARLOW
Senior Industrial Hygiene Engineer, New York State Department of Labor

**The spray painting booth is one of the most common types of industrial exhaust systems. Essentially, it is a space enclosed at the sides, rear, top and bottom with an open front, and exhaust provided at or near the rear. Information is presented on safe design and operation of such spray booths that are provided with paint filters.**

FROM the standpoint of health and safety, two main purposes are served by the use of a spray booth. Where the spray coat material contains toxic substances, the booth must serve to protect the workers from any inhalation hazards. For flammable spray coat materials, the booth must contain adequate safeguards against fire and explosion. The usual spray coat materials, such as shellac, varnish, lacquers, paints and synthetic enamels are considered both toxic and flammable, making it necessary to keep the above two objectives in mind in the design and use of any type of spray booth.

Fig. 1. Dry type bench spray booth. Courtesy, Binks Manufacturing Co.

### Types of Spray Booths

Spray booths may be classified in terms of the method used to collect the overspray. They include:

1. Dry type spray booth with metal baffles for distribution.
2. Water wash spray booth
3. Dry type spray booth with overspray filters

The conventional dry type spray booth, Fig. 1, is the most commonly used in spray coating operations. Its distinctive design feature is the use of metal baffles or distribution plates that have a primary function to distribute the air flow evenly through the cross-sectional area of the booth. An incidental effect of these baffles is to collect, by impingement, as much of the overspray as possible. The main advantage of this conventional booth, when compared with the other types, is its lower initial installation cost.

The water wash booth, in general, may be described as one in which the rear wall of the booth is flooded with a curtain of water with water sprays behind the curtain. In operation, the exhaust air containing the overspray passes through this water curtain and is scrubbed before being discharged. Eliminator baffles are used to remove water mist from the discharged air. This type of booth will remove a large percentage of the nonvolatiles in the spray coat material; practically none of the solvent vapor is removed. A uniform distribution of air flow through the cross-sectional area of the booth is achieved by both the plenum effect behind the water curtain and the relatively high air flow resistance.

The main advantages of the water wash booth installation when compared with the conventional dry-type spray booth are:

1. It reduces the amount of atmospheric contaminants released to the outside.
2. It reduces the fire hazard associated with the accumulation of spray coat residues inside the ducts, on fan blades, and on the outside.

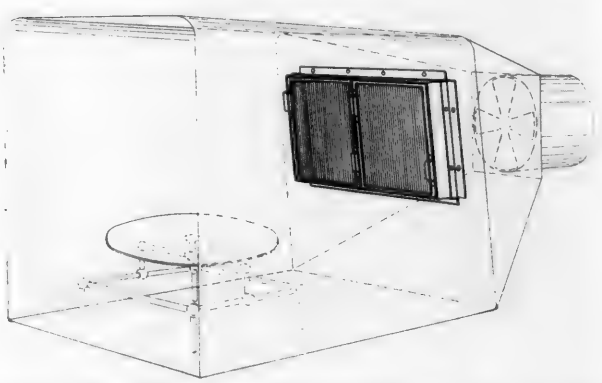

Fig. 2. Method of applying renewable filters to a spray booth. Courtesy, American Air Filter Co., Inc.

3. It reduces the maintenance and cleaning required to remove spray coat residues from the duct interiors, fan blades, etc.

Chief disadvantages are its relatively high initial installation cost and its higher power operating costs.

The third type of spray booth, namely the dry booth with overspray filters, has come into increased use in the last few years chiefly because of the growing emphasis on air pollution abatement. It has the advantages of the water wash booth with an initial installation cost only slightly higher than the conventional dry-type booth. The filter installation is, therefore, presently in direct competition with the water wash booth. Only an annual cost analysis including amortization of the booth, maintenance costs, filter replacements, etc., would determine which type of installation would be preferable from an economic standpoint.

### Types of Filters for Overspray Filter Booths

The conventional dry-type booth is converted to an overspray filter installation by replacing the baffles or distribution plates with a frame which contains the paint filters, Fig. 2. The frame extends across the back of the booth separating the booth proper from a rear plenum to which the exhaust duct is connected.

Both renewable and throw-away type filters are available commercially. One available renewable type consists of die-stamped metal baffles spaced to form sinuous passages through which the exhausted air travels. The entrained paint particles are arrested by impingement upon the surfaces of the vertical baffles. Each unit, Fig. 3, consists of a removable interchangeable cell and frame.

There are presently two types of throw-away, dry filters being used in paint filter installations. One is a chemically treated corrugated cellulose filter pad which is available in a stock size, 20 in. x 20 in. x 1 in. thick. The other is a glass wool mat which can be obtained in the form of various width sheets 1, 2, and 3 in. thick. The glass wool filters are also available in several stock sizes.

A filter bank, Fig. 4, for the stock size filter pads is formed by fastening a sufficient number of holding frames together to provide a maximum face area. A metal grid backing placed in the downstream side of each frame holds the filter pads in place. It is common practice to use two filter pads in series. A metal grid may also be placed on the upstream side of each frame but the use of this grid has been found to be unnecessary in many filter banks.

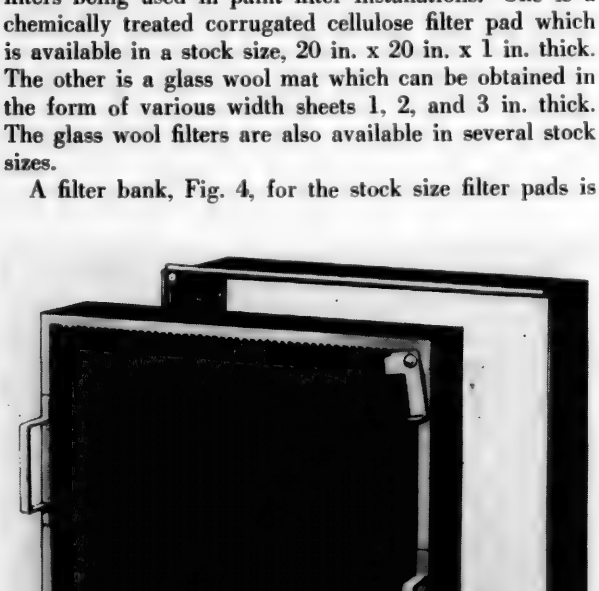

Fig. 3. Renewable filter cell and frame. Courtesy, American Air Filter Co., Inc.

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Where the glass wool media is used in the form of sheets, it is fastened to an expanded metal backing which is substituted for the conventional, metal baffles. The expanded metal is braced by means of an angle iron frame which in turn is fastened to the sides and top of the booth. If the booth cross-section is large, cross or vertical braces are necessary. A horizontal row of spikes facing the upstream side are fastened to the frame near the top. These are used to fasten the sheets of glass wool to the expanded metal backing. Additional horizontal rows of spikes, spaced at 15 in. to 24 in. intervals, may be required to help support the filter media after being loaded.

The clean filters should be non-combustible or of a type having a combustibility not in excess of Class 2 filters as listed by the Underwriters' Laboratories. Class 2 filters are those which, when clean, burn moderately when attacked by flame.

### Designing the Booth for Safety

In the case of the conventional dry spray booth, the air flow exhausted through the booth remains essentially constant throughout the operating period between scheduled cleanings, except where a poor maintenance program will permit excessive deposits of spray coat residue to accumulate on the interior of the ducts and on the fan blades. Such excessive deposits can reduce the effective cross-sectional area of the ducts, particularly in elbows, to such a point that airflow will be greatly reduced. Furthermore, the deposition of material on the fan blades can change the airflow characteristic of the fan and thus also reduce the airflow. Water wash booths minimize the amount of deposits accumulating on the fan blades and duct interiors ensuring a more or less constant airflow into the booth.

For a spray booth with paint filters, Fig. 5, a build-up of spray coat residue accumulates on the filters, resulting in an increased resistance to air flow through the filter bank. Therefore, as the spraying operation continues, the air flow decreases from a maximum, when the filters are clean, to a point where air flow will decrease to a dangerously low level. The rate in decrease of air flow

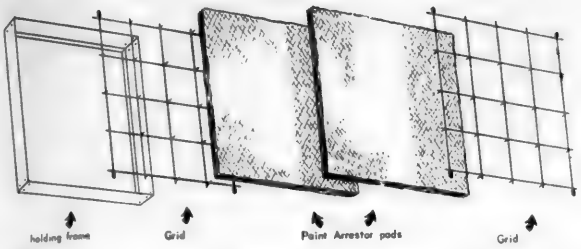


Fig. 4. Holding frame and throw-away filter pads or paint arrestors. Location of grids are shown.

as the deposits accumulate on the filters, is much more rapid than that which may occur in the conventional dry booth from accumulation of deposits on the duct interiors and fan blades.

By providing the maximum filter area possible, the overspray load is distributed over a greater part of the filter bank. In this way, the rate of build-up of deposits per unit filter area is kept at a minimum, resulting in a lower rate of decrease in air flow. Accordingly, the required maintenance frequency of the filters is also reduced. Except for the necessary framing and supports for the filter bank, the filters should therefore extend throughout the entire cross-sectional area of the booth. It is good practice to have a net filter area at least 75% of the cross-sectional area of the booth. The depth of the plenum behind the filter bank should not be less than the nominal diameter of the axial flow fan plus an additional clearance of 6 in.

Many codes, including those of New York State, require a minimum control velocity of 100-150 feet per minute through the front opening or cross-sectional area of the booth. It is, therefore, necessary to replace the loaded filters when the airflow is reduced below the minimum control velocity. A visible gage or audible alarm device may be installed to indicate when such a point is reached. For plants where there is a strict maintenance and safety program, this procedure may be satisfactory. A preferable, and usually necessary, means of ensuring regular filter changes is to remove the human element from this determination and to install an automatic device interlocked in some way with the spray gun so that it would be impossible to operate the gun when the airflow falls below the minimum control velocity. In the average plant, indicating gages cannot be relied upon to provide a suitable filter changing schedule.

### Airflow Interlocking Devices

The type of interlock most applicable and most often used is a pressure actuated switch. A schematic arrangement indicating how the switch is used is shown in Fig. 6. The suction side of the device is connected to the plenum behind the filter bank. The pressure side of the device is open to the atmosphere. Thus, the switch is actuated by a negative pressure differential which is equivalent to the resistance of airflow through the filter bank.

When the pressure drop across the filters is less than the value equivalent to the minimum control velocity, the pressure switch contacts are closed, keeping the solenoid air valve open. When the pressure drop reaches a value equivalent to the minimum control velocity, the pressure switch contacts are open. This closes the solenoid air valve shutting off the air supply to the spray gun. Some pressure actuated switches available commercially and a brief description of their principle of operation are given in Table 1.

These switches respond to a pressure differential and, essentially, not to air flow. After installation of the device, it is necessary to adjust it in terms of the minimum control velocity. This is best done by covering the clean filter surface on the upstream side with cardboard or heavy paper until the average velocity in the booth, as measured with an air velocity meter, is equal to the minimum control velocity. The device is then adjusted so that the switch breaks the circuit at this air flow. In designing a filter booth of this type, the fan must be selected to maintain air flow rates above the required minimum. The exact quantity will depend on the rate of air flow decrease and on an optimum interval between filter changes.

Unless the switch and the solenoid valve have explosion-proof housings with a Class I, Group *D* (hazardous locations) approval by the National Board of Fire Underwriters, they should be located at least 20 ft from the booth opening in order to comply with the requirements for most fire protection standards.

### Additional Design Requirements

Additional paint filter booth design requirements which are of particular significance include:

1. The installation of approved automatic sprinkler head(s) in the plenum, behind the filter bank.
2. An access door at the side of the plenum to permit periodic inspection and maintenance of the sprinkler head(s), fan blades and bearings.

Furthermore, in determining the system resistance, which enables the designer to specify the fan size, rpm and motor horsepower required, a filter resistance must be included. This resistance, used in the system-resistance computation, must be equivalent to the loaded filter resistance when the minimum control velocity is reached. Ratings of resistance losses in terms of air flow for clean filters are, therefore, of no value in this application. A check of several paint filter booth installations indicates a value of 0.5 in. w.g. to be the most reasonable to

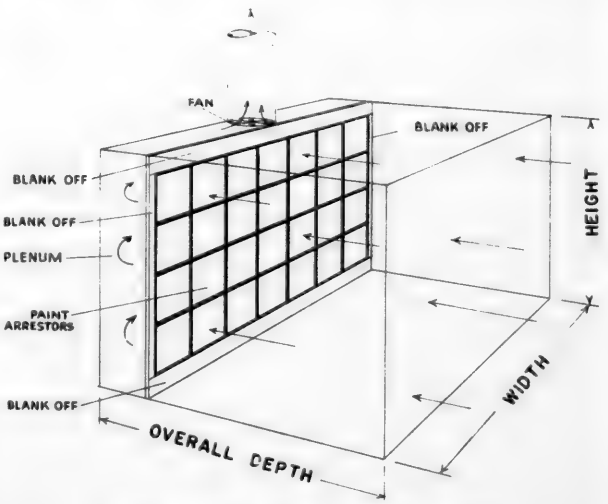


Fig. 5. Spray booth with paint filters.

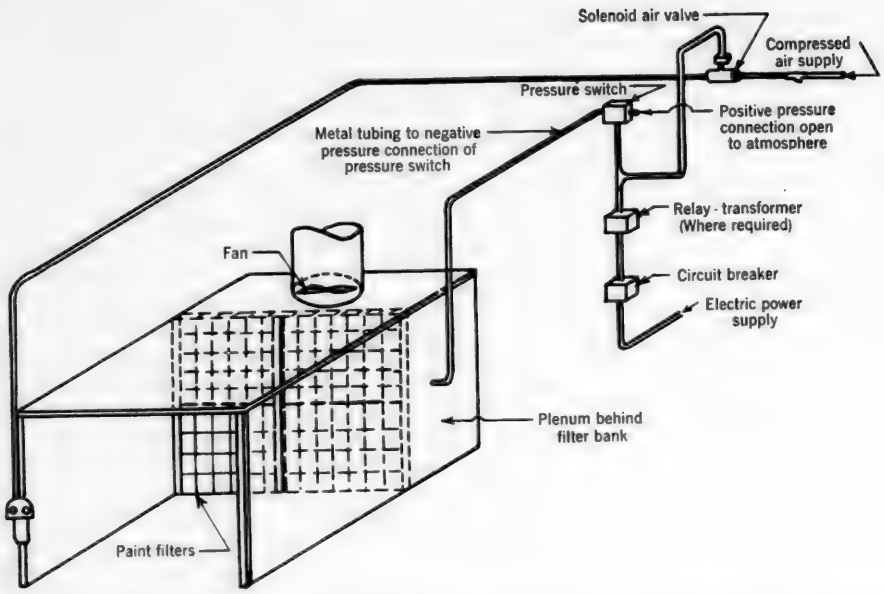


**Fig. 6. Schematic arrangement showing how pressure switch is used with paint filters.**

assign for the loaded filter loss in system resistance calculations.

### Maintenance of Filters

The frequency of cleaning or changing of the filters depends, among other things, on the type of spray coat material being used. Lacquers and similar quick-drying sprays are practically a dry dust by the time they reach the filter. Varnishes, synthetics, high-bake enamels and similar slow drying materials reach the filter as a liquid spray and adhere to the filter, usually in the form of a skin.

The renewable metal filters must be coated with a light water soluble filter oil, for fast-drying materials, in order to retain the dust-like particles. The dirty filters are serviced in the conventional manner with washing and charging tanks or may be reconditioned by washing with a hose and spraying the cleaned units with the light filter oil. With the slow drying finishes, the renewable filter is used dry and may be cleaned by immersion in a paint-stripping tank containing a hot caustic solution. A rotation method of cleaning is recommended where several installations are involved. By this method, a certain number of units are cleaned each time rather than attempting to clean the units for all the installations at the same time. In any event, spare units must be provided to keep the down-time to a minimum and thus cut operating costs.

In the case of the throw-away filters, the bulk of the paint load is deposited on the front or uptake filter pad. For this reason, it is usually changed more frequently than the rear filter pad. The life of the front filter pads may be increased by a modified method of cleaning. Where the residue collected is a powder-like dust, the material may be loosened by rapping the filters lightly or by poking the filters with a pronged rod. Slow-drying finishes collected by the filters can not be removed effectively without removing some of the filter material also. Where glass wool filters are used, the residue may be scratched off with a plasterer's scraper or peeled off with some of the filter media. Scraping and peeling of the filters should not be carried any further once the rear filter pad or layer is reached.

All the discarded filters including the scrapings, etc.

**TABLE I—COMMERCIALLY AVAILABLE PRESSURE ACTUATED SWITCHES**

| No. | Control Range, Inches Water | Electrical Rating | Principle of Operation |
|---|---|---|---|
| 1 | 0 to 3.5 | 1 amp AC at 115 v. | Circuit is opened by movement of a switch blade actuated by a signaling vane. Signal vane actuated by air passing through the gage. |
| 2 | 0 to 2 | 0.25 amp AC at 110 v.<br>1/8 amp AC at 220 v. | Two bells are suspended from a lever into a tank of oil. Negative pressure under one of the bells moves the bell and an attached lever, breaking contact with the electrical circuit. |
| 3 | 0 to 2 | 0.30 amp AC at 115 v.<br>0.15 amp AC at 230 v. | Two pressure chambers are separated by a diaphragm. One of the pressure chambers is connected so that contacts are broken when negative pressure increases. |
| 4 | 0 to 2 | 15 amp AC at 125 v.<br>15 amp AC at 250 v. | Similar to No. 3. |
| 5 | | 10 amp AC at 110 v.<br>5 amp AC at 220 v. | Backward motion of a swinging vane actuates a microswitch to open the circuit. |

should be removed to a well-detached location, and disposed of in the manner required for combustible refuse. If the material cannot be removed immediately, it should be placed in a water-filled metal container and disposed of at the close of the day's operation. Under no circumstances, should this refuse be left in the plant in a dry state.

In general, paint filters should never be used in a booth where two or more types of coating materials, such as lacquer and varnish, are sprayed. The intermingled deposits of such materials may cause oxidation or chemical reactions with resultant spontaneous combustion or explosion. If alternate application of such materials is required, the spray booth and exhaust duct, as in the case of all spray booths, must be cleaned of all traces of finishing material formerly applied and the used filters must be replaced.


## Summary

An increasing demand for abatement of air pollution of industrial origin has resulted in a growing use of paint filters in spray booths.

In considering the safe design and use of spray booths with paint filters, specific mention has been made of those features which are of significance to such installations. These include the types of paint filters commercially available, installation of the filter bank, filter area required, the necessary air-flow interlocks, the loaded filter resistance, and the maintenance and replacement of the filters. The fact that only these items were considered does not mean that the usual design and maintenance requirements for spray booths in general should be neglected. The type and location of lighting fixtures and the cleaning of the booth interiors, as in the case of all types of spray booths, must also be taken into account.


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# Smog Fighters Tackle the Organic Solvents

Organic solvents, suspected for some time as an important contributor to smog production, is the subject of study by the Los Angeles Air Pollution Control District. Hundreds of tons of this family of compounds are dumped into the atmosphere daily. Codification of solvent recovery standards, however, awaits development of suitable measuring devices.

The solvents under attack are liquids used to dissolve. dilute, or disperse other substances. Paint and ink are obvious examples, but the use of solvents permeates our technology. These liquids are what the chemists term "organic," that is, they are compounds of carbon.

Organic substances, and particularly that group called hydrocarbons and which includes gasoline, have been demonstrated to be basic ingredients of the type of smog typical of Los Angeles. Many of the solvent compounds contain hydrocarbons, or various related substances such as alcohols, ethers, or other organics which have a high potential for smog formation.

These substances enter the atmosphere as vapors. The drying of paint, for example, results from the evaporation of the solvent, which leaves the binder and pigment as a film on the surface to be protected. Once in the air, the vapor is exposed to sunlight, nitrogen oxides, moisture, oxygen, and other influences, causing it to begin a series of chemical changes, labeled "the smog reaction." In laboratory experiments, the reactions of organic solvents to such conditions yield compounds that produce the same symptoms as does natural smog—eye irritation, rubber cracking, and plant damage.

The use of solvents is so extensive that it is difficult to single out a manufactured article which was made without their consumption. Not only are solvents required in paints, varnishes, enamels, stains, and other coatings, but they are a necessity in printing and glueing the package in which products are marketed. Solvents are used in the creation of cans, tubes, and labels, as well as in the finishing of houses, automobiles, and furniture. In the preparation of surfaces, solvents clean and degrease, and remove paint and varnish. Large amounts of solvent are employed in the cleaning of fabrics and metals.

To determine the quantity of solvent used in Los Angeles County, a survey was made covering dry cleaners, rotogravure plants, paint manufacturers, automobile assembly plants, aircraft companies, and manufacturers of cans and containers, furniture and appliances.

An estimate based on present knowledge is that about 400 tons of organic solvents are being vaporized to the atmosphere of Los Angeles County every day from such use. This amounts to about one-fifth of the total daily organic vapor emissions.

Organic solvents thus appear to be a significant part of the smog picture, both in quantity and quality. The deduction made by the Air Pollution Control District is that the cutting down of organic solvent emissions is a worthwhile effort and will help reduce smog. Ultimately there must be a rule written which defines with great precision, exactly what must be controlled and to what degree. A prerequisite is that there exist a satisfactory method of control, and that its efficiency be measurable.

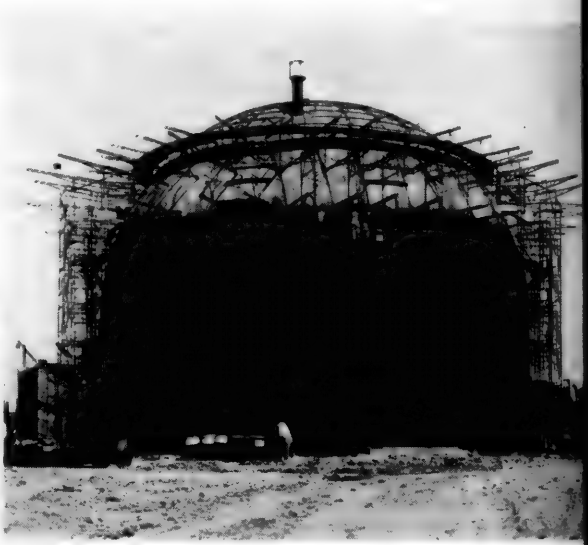
Solvent recovery systems have been developed in many industries because of the quantities of solvent used and their high cost. Where the price of the solvent is low and the expense of recovery is high, solvent has been permitted to evaporate without restriction. One method of control which has been successful recovers solvent by passing the vapor through activated charcoal. The solvent is adsorbed by the charcoal and may later be stripped off with steam and then condensed. Solvent loss may also be controlled by burning the vapors, either in a direct flame or by catalysis, that is, by passing the vapor over a metal such as platinum, which induces burning.

Measuring the efficiency of solvent recovery devices for the purpose of determining whether legal standards are being met has been a stumbling block. If the law prescribes a standard of efficiency, there must be a way to measure adherence to the standard. Many air pollutants may be measured by reliable and well-established methods, for which instruments exist. However, due to the chemical nature of hydrocarbons and the conditions under which solvents are used, such as heated paint bake ovens, there are still many engineering and chemical problems to be solved before practical instruments for measuring solvent recovery devices can be designed.

Air Pollution Control District scientists are working on several approaches to building such an instrument.

AIR-SUPPORTED-AND-CONDITIONED DWELLING. (Above, left) U.S. Rubber's Fiberthin Airhouse, designed by Fra Lloyd Wright, gets field test in Lexington, Ky., near plant of fabricator, Irvin Air Chute Co. Standard 3-hp residenti air conditioner from Airtemp Div., Chrysler Corp., supplies continuous volume of low pressure air which is sole means structural support, and in addition provides complete air conditioned comfort for occupants. (Above, right) As shown New York Coliseum's International Home Exposition, this is the living-room area of a residential application of t unique Airhouse which features special revolving-door entrance, virtually eliminating air leakage. Other applications clude construction shelter, storage warehouse, temporary school, and military purposes.

# Picture Paragraphs



ATOMIC REACTOR SHELL. Argonne National Laboratories' experimental boiling water reactor near Chicago has recently gone into operation. It is surrounded by a huge airtight cylinder of steel topped by a dome with almost half of the shell below ground. All that is above grade is covered with a layer of 3-inch thick blocks of Foamglas insulation (product of Pittsburgh Corning Corp.). Shell serves both to contain radioactive gases in the highly unlikely event of an explosion and as insulated enclosure for the air-conditioned interior. Photo shows insulation being applied).

OF BULLETS AND BTUs. Air conditioning a station bullet-proof truck serving as cashier's cage in a te porary frame office for National Bank of Comme in Norfolk, Va., was problem facing Climatemak Inc., of that city. Interior of Brink's armored truck h to be made livable; at the same time, rigid safety r quirements of insurance firm had to be met. Ventilat louvers in roof of truck were removed and connection as illustrated, were made to a Mitchell Mfg. Co., 2- stow-away unit which was installed through the w at one end of frame building. Two ceiling diffuse were placed in open area to take additional capaci of the air conditioner.

AIR CONDITIONING, HEATING and VENTILATING'S

REFERENCE SECTION

OCTOBER, 1957

# Air Conditioning for Motels

LEONARD N. BROWN and EUGENE L. VALERIO
Engineers, Unitary Equipment Division, Carrier Corporation

**Comparative information on air conditioning systems suitable for installation in motels**

One of the many modern types of motels available to the traveler.

# Air Conditioning for Motels

LEONARD N. BROWN and EUGENE L. VALERIO
Engineers, Unitary Equipment Division, Carrier Corporation

Today, only one generation after its acceptance by the American public, the motel has become big business. There are now about 60,000 motels in the United States offering the traveling public close to 1,200,000 rental units, and the number of motels is increasing yearly by approximately 2,000. Air conditioning is considered one of the features which appeal most to the motel guests. Most of the larger motels, particularly those being erected by a hotel or motel chain, include air conditioning as a "must." Comparative information is presented on the various air conditioning systems suitable for motels.

THE design of an air conditioning system for a motel is governed largely by the geographic location of the motel and its architectural design and construction. In the Northern and Eastern parts of the country, the general tendency is to use relatively heavy construction with brick and concrete, and glass areas limited in size, to some extent. The larger motels in the East may also have a central corridor, similar to the arrangement in a hotel. Since heating is always required in the winter, a central heating plant rather than individual room heaters is included.

In the South and Southwest areas, light construction such as frame and light cinder block, predominates. Glass areas are extensive, and central corridors are rare. Central heating plants may be found, but individual room heaters are far more common.

## General Room Arrangement

The great majority of motels take the form of a long, low rambling structure, one story in height. Some motels may be two-story, but never more than this. Sometimes instead of arranging the rooms in one long row, detached or semi-detached wings or blocks of rooms are used to form the motel.

There are three commonly used arrangements of the guest rooms within the structure: Back-to-back, side-by-side, and central corridor. The back-to-back arrangement is illustrated in Fig. 1A. A feature of this arrangement is the grouping of the baths around the intersection of common walls, thus permitting easy installation of plumbing. It can also be seen that this arrangement simplifies piping and/or wiring to ceiling hung air conditioning units furred in above the alcove between the bath and open closet.

With the side-by-side arrangement, Fig. 1B, each guest room has two exposed walls and access to the room from the outside is possible at either end. To the air conditioning designer, this means a greater heating and cooling load on the room. The baths are usually placed on a common wall, and because each bath has an exterior exposed wall, it may be necessary to provide heating means in the space to maintain comfortable conditions, in northern climates especially. This arrangement also suggests the possibility of placing a room air conditioner or fan-coil unit above the closet, or above the alcove between the bath and closet.

The center corridor arrangement, Fig. 1C, will usually be found only in the larger hotel type of motel. The center corridor lends itself to placement of the air conditioning unit, or discharge outlet from a duct system

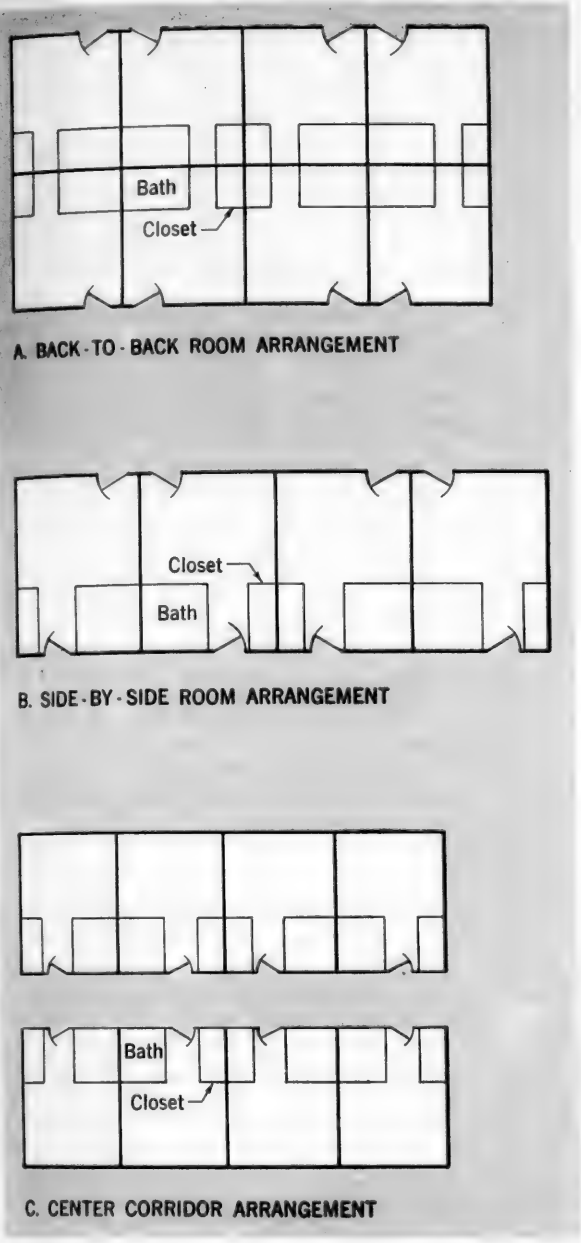



Fig. 1. Plans showing three typical room layouts.

above the entrance door. The corridor ceiling could be furred down to conceal the piping or ducts.

### Individual Room Layout

Most motel guest rooms are generally arranged as shown in Fig. 2 and 3, which are plan views of typical rooms as designed for two motel chains. One motel chain employs a back-to-back arrangement with the individual room laid out as shown in Fig. 2. This room is shown with a fan-coil unit placed under the window, and a small hot water convector placed in the bathroom.

Another motel chain uses the side-by-side arrangement, as shown by a typical layout, Fig. 3. This room has ceiling to floor glass in the front, and in this case, the fan coil unit has been placed adjacent to the closet. In northern climates, it would be preferable to design the motel room front with the glass running only to a point

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Eugene L. Valerio is an application engineer with the Unitary Equipment Division, Carrier Corp. He is a graduate of Villanova University and he entered the employ of Carrier in 1954 following two years of Army service as an ordnance design engineer at Picatinny Arsenal, and two years with a manufacturer of heating and ventilating equipment. He is an associate member of ASHAE.


about two feet from the floor, rather than all the way down. A fan-coil unit could then be mounted below the large glass area for optimum heating performance.

### Factors of Design

The air conditioning design engineer for a motel has a wide choice of equipment and systems available to him. His selection will depend on a variety of interacting factors, some of which he can control, and others which are fixed for him in the architectural design and location of the motel.

One of the more important considerations is the area in which the motel is located. In the warm climates, emphasis must be placed on the cooling system, with separate heating means or none at all. In colder climates, the system must be expected to do an equally good job on both heating and cooling, and a year-around system is best. The arrangement of the rooms and the amount of glass area are deciding factors in locating the point at which heated or cooled air will be introduced. Therefore, the ease and cost of installation of various systems to distribute air from this point should be considered. Air for ventilation is usually not necessary in motel guest rooms, but if required, it can be most easily taken in at a central point through the equipment in an all air system. Individual room units will require openings in the exterior wall of each room. Individual room control (an important consideration for a motel) can best be effected by placing a unit in each room. In existing construction, the designer is often limited to room air conditioners of the window or console type, because of the cost of installing piping or ducts.

Each system has its advantages and disadvantages when referred to a specific motel, and therefore the choice of a system must necessarily be made on a per job basis. The various types of systems discussed are those commonly used in motels which are characterized by long, low construction, that is seldom, if ever, over two-stories in height.

## YEAR-AROUND SYSTEMS

In areas where cool and winter weather are experi-

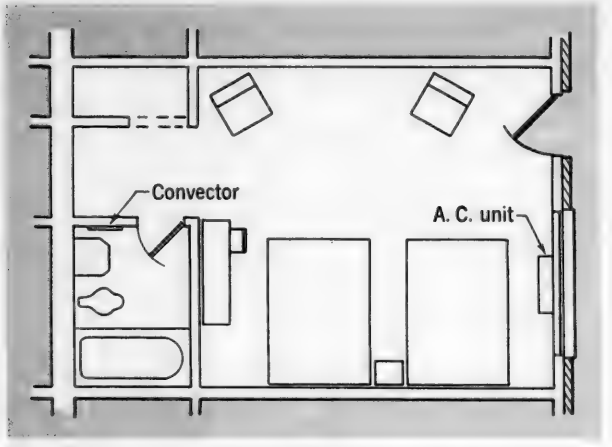


**Fig. 2. Typical arrangement of furniture, air conditioning unit and bathroom in a back-to-back arrangement.**

enced, it may be desirable to have a year-round system so that the motel may remain in operation throughout the year. Such systems can easily change over from cooling to heating, depending upon operating conditions.

### Hot and Cold Water System—Individual Room Units

The system which offers many advantages on most applications is a water system, with individual fan-coil units in each room, and a hot water boiler and a water chilling located in the equipment room.

The fan-coil unit for the average motel guest room is compact, relatively quiet, and may be easily controlled by the room occupant. Most manufacturers offer units which can be mounted against the wall, partially recessed into the wall, completely recessed in the wall, or hung at the ceiling.* In northern climates, the usual location of the fan-coil unit is beneath the windows. In warmer climates, where heating requirements are not particularly critical, the unit may be furred-in or hung above the closet. In these cases, air is distributed from a high point on the inside wall, blowing towards the exterior wall and windows. Supply piping is simplified with an "over-the-closet" design, but the system may not always be preferred because of poorer performance on the heating cycle, and because servicing of an overhead furred-in unit is somewhat more difficult than servicing a floor-standing unit. Ventilation air, if used, may be supplied to the unit through an intake grille in the outside wall, or ducted to a ceiling hung unit from a roof or attic opening.

Easy and effective control of the unit by the room occupant, either manually or automatically, is an important advantage of the system. Manual control may take the form of fan speed control, water flow control, or both of these.

Most manufacturers provide at least two steps of manual fan speed control by a switch which may be mounted in the unit or on the wall. Manual water control can be effected by a throttling valve or three-way diverting valve, the operating handle of which is accessible to the occupant. The least expensive yet satisfactory control for most installations is manual control of fan speed and positive shutoff of water flow by means of a water solenoid valve wired to close whenever the fan motor is de-energized. Positive interruption of chilled water flow during periods when the fan is idle will prevent condensation on the unit cabinet; condensation may be possible under certain conditions even though the unit is insulated to some extent.

Automatic individual room control methods utilize a wall mounted or return air heating-cooling thermostat which can be set as desired by the room occupant. The thermostat may be arranged to control water flow, or both fan operation and water flow simultaneously. In most cases when using a wall mounted thermostat, care should be taken for interruption of water flow when the fan is manually shut off. Among the many possibilities of control arrangements, the following are most common:

1. Thermostat on-off control of water solenoid valve—continuous fan operation.
2. Thermostat on-off control of both fan and water solenoid valve.
3. Pneumatic modulating thermostat control of water flow (straight through or three-way valve).
4. Self-actuated modulating valve controlling water flow.

The self-actuated modulating valve is a comparatively recent development. This valve is self-contained and requires neither pneumatic nor electrical connections. Automatic summer-winter changeover is built into the valve, and its modulating action gives close and smooth control.

Summer-winter changeover of the hot and cold water system in a motel is most often controlled manually. The changeover can be made by manually positioning the flow valves in the equipment room and energizing the boiler or water chilling machine, as the case may be. It is always advisable to provide a main changeover switch in the equipment room to reverse the action of all the three-wire room heating-cooling thermostats (if used), so it will be unnecessary to enter each room to perform this function. The changeover may also be made remotely by a central switch controlling two-position, three-way valves in the equipment room and the room thermostat action.

Some control arrangements make it unnecessary to provide changeover of the thermostat action. One such arrangement uses an aquastat at each unit to sense whether hot or cold water is in the system, and the aquastat then automatically changes the thermostat action accordingly. Another automatic control arrangement is the self-actuated valve having a built-in changeover feature.

Outside air compensation of hot water supply temperature is an accessory control which will more than earn its cost in smooth and stable operation of the system during the heating cycles. It is especially valuable during intermediate seasons, when it will help prevent overheating of the guest rooms. This control usually operates to bypass return water around the boiler. The amount of bypassed water depends on the control point of the water temperature controller which is set by the outdoor compensator.

Equipment room water piping for a typical year-around system is shown in Fig. 4. In this system, summer-winter changeover is accomplished manually by positioning valves V-1 and V-2. Hot water supply temperature is controlled by an outdoor air compensator. With a water

* Specification data and photographs of many fan-coil units are included in an article entitled "Underwindow Fan-Coil-Filter Units for Year-Round Air Conditioning" by G. B. Priester, *Air Conditioning, Heating and Ventilating*, December, 1955.

system, it is possible to locate the equipment room almost anywhere within the structure, or even in a separate building. Normally it is placed at the end of a row of guest rooms, and good practice would indicate a central location within the group of motel buildings to eliminate long runs of piping.

Most motels today are built on a concrete slab. With a perimeter system (units beneath the windows) the supply and return header piping should be insulated and buried in gravel or vermiculite below the slab. Uninsulated condensate headers are also run beneath the slab. When the fan-coil units are furred-down above the closet on the interior wall, it is advantageous to run the supply and return piping overhead in the attic space. However, condensate lines are sometimes a problem with this type of installation. It may be necessary to bring lines down from each unit to a header properly pitched beneath the slab. The condensate header should drain into an open sump or drain, which may be located in the equipment room. When laying out the piping, the engineer should give consideration to the desirability of designing the system and placing valves so that it may be possible to close off a wing or section during a slack season or for repairs.

Package hot water boilers and water chilling machines in a wide range of capacities are available for year-around water systems. The package units are particularly suitable for motel work because of their compact design and ease of control. The water chilling machines consist of a direct expansion or flooded cooler, compressor(s), and most often a water cooled condenser. In areas where the water supply is scarce or of poor quality, evaporative or air-cooled condensers may very often be used with the package chiller. Where exterior appearance is a consideration, the evaporative or air cooled condenser could be installed within the equipment room, with intake and discharge air ducted to and from the equipment.

### All-Air Systems

Although not as common as Hot and Cold Water Systems with individual room units, all air systems are sometimes used. An all-air system is one in which the cooling and heating functions are both accomplished with conditioned air supplied through ducts from a central source or multiple central sources, depending upon the size and layout of the motel.

For small motels, or motels consisting of relatively small blocks of construction, it is possible to use commercial or residential self-contained type units having all the components for cooling and heating in one or more packages at each individual central location.

The other arrangement, applicable to any size motel, consists of provision for a single central equipment room for the refrigeration compression and condensing equipment, and also the heating boiler if hot water or steam is used. If the motel is constructed in single blocks of rooms, the air handling unit, consisting of centrifugal fan, cooling and heating coils and filter, may also be located in this same equipment space. Where multiple and separate blocks of rooms are used, separate air handling units are located in each block, and the cooling or heating effect is transmitted from the central equipment room by means of chilled or hot water lines, or refrigerant piping for direct expansion type units for cooling only.

Air distribution from either arrangement would be

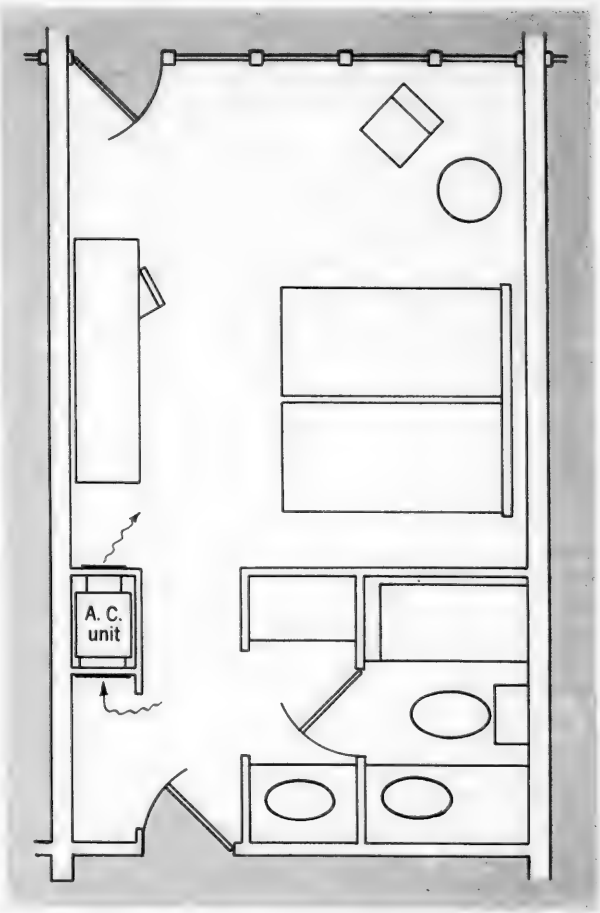


**Fig. 3. Placement of furniture, air conditioning unit and bathroom in a side-by-side arrangement.**

similar except that the latter arrangement, with separate air handling units, lends itself to more versatility in design and control. Through the use of appropriate type equipment, the following common designs are available:

Single supply duct non-zoned system
Single supply duct zoned system
Double supply duct system

Single duct non-zoned systems utilize air handling units capable only of supplying air at the same temperature to all outlets. The location of the supply duct is dependent upon the type of construction involved. Where a center corridor is used, the supply air duct is usually run through the corridor with the ceiling dropped below it. The run-outs from this corridor duct to each room can be located in a furred space above the closet, or above the room entrance between the bath and closet. Air is then introduced into the room through a wall type outlet. Another arrangement involves the use of a periphery duct in the floor slab, feeding up through grilles at or below the windows.

Single duct zoned systems usually use a multiple zone type air conditioning unit. Each zone duct leading from the unit can select its own mixture of cooled and bypassed air in the summer, or heated and bypassed air in the winter, to satisfy its own thermostat located somewhere in the particular zone. After leaving the unit, each zone duct would be generally located as described in the preceding paragraph. The various branch ducts from a non-

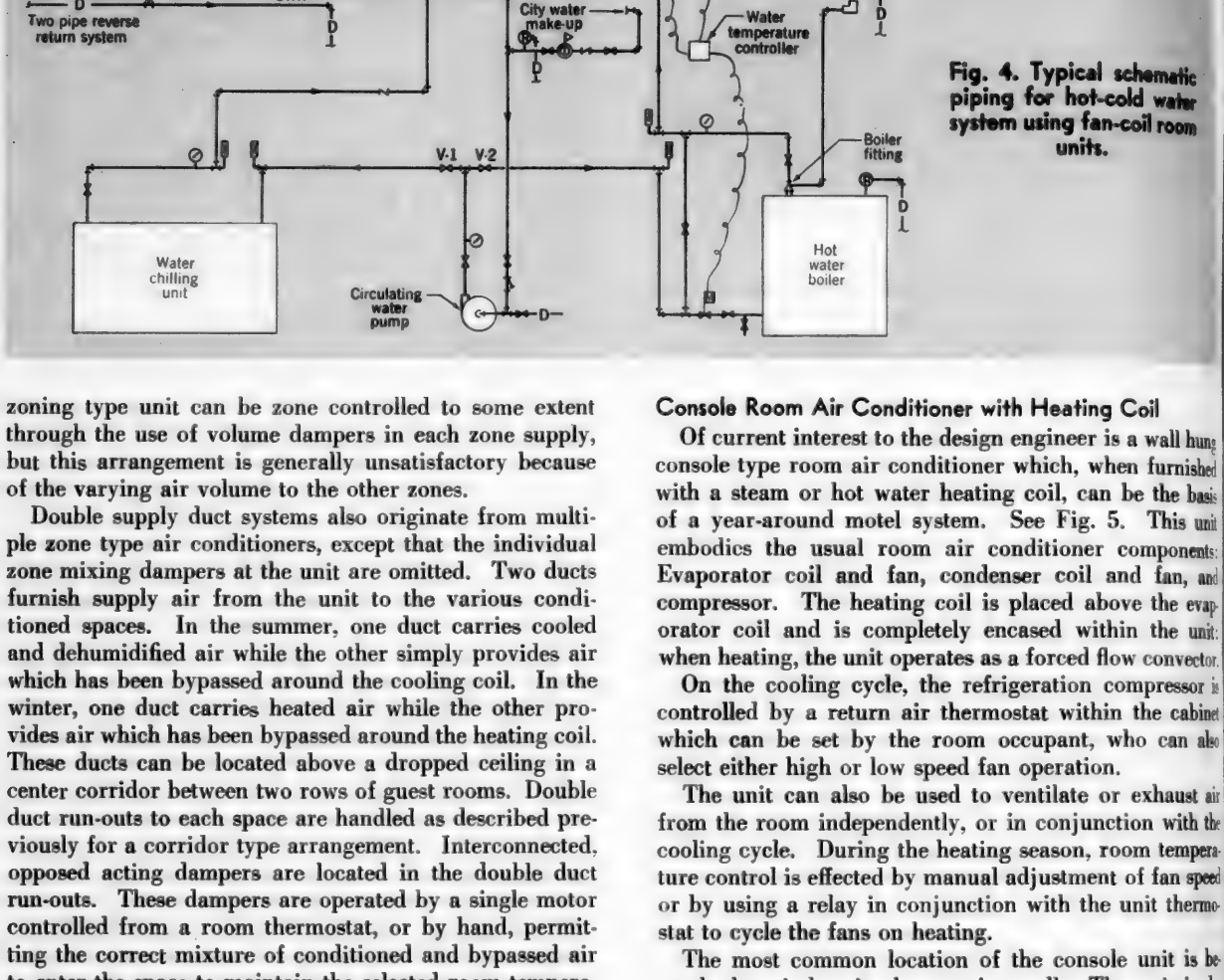


**Fig. 4. Typical schematic piping for hot-cold water system using fan-coil room units.**

zoning type unit can be zone controlled to some extent through the use of volume dampers in each zone supply, but this arrangement is generally unsatisfactory because of the varying air volume to the other zones.

Double supply duct systems also originate from multiple zone type air conditioners, except that the individual zone mixing dampers at the unit are omitted. Two ducts furnish supply air from the unit to the various conditioned spaces. In the summer, one duct carries cooled and dehumidified air while the other simply provides air which has been bypassed around the cooling coil. In the winter, one duct carries heated air while the other provides air which has been bypassed around the heating coil. These ducts can be located above a dropped ceiling in a center corridor between two rows of guest rooms. Double duct run-outs to each space are handled as described previously for a corridor type arrangement. Interconnected, opposed acting dampers are located in the double duct run-outs. These dampers are operated by a single motor controlled from a room thermostat, or by hand, permitting the correct mixture of conditioned and bypassed air to enter the space to maintain the selected room temperature.

Return air provisions must be made where all air systems are used, for economy purposes. Where center corridor construction is used, then this is a natural avenue for return air to find its way back to the air conditioning unit. Louvers in each door serve to relieve this air from each space to the corridor. Where center corridors are not available, it is then necessary to run return air ducts in the floor slab, or overhead in the attic space.

All air systems in the colder climates are generally not completely satisfactory unless the periphery type under window distribution is used, to offset the principal heat loss which occurs at this point.

Individual room control with all air systems is possible only with double duct systems or volume dampers at each room supply.

Of these two methods, the double duct system is by far the more satisfactory, because the adjustments made in any one room cannot have any effect on the air quantity delivered to the other spaces. In systems using volume dampers, the throttling of dampers in some rooms results in increasing the air volume delivered to the other spaces.

### Console Room Air Conditioner with Heating Coil

Of current interest to the design engineer is a wall hung console type room air conditioner which, when furnished with a steam or hot water heating coil, can be the basis of a year-around motel system. See Fig. 5. This unit embodies the usual room air conditioner components: Evaporator coil and fan, condenser coil and fan, and compressor. The heating coil is placed above the evaporator coil and is completely encased within the unit: when heating, the unit operates as a forced flow convector.

On the cooling cycle, the refrigeration compressor is controlled by a return air thermostat within the cabinet which can be set by the room occupant, who can also select either high or low speed fan operation.

The unit can also be used to ventilate or exhaust air from the room independently, or in conjunction with the cooling cycle. During the heating season, room temperature control is effected by manual adjustment of fan speed or by using a relay in conjunction with the unit thermostat to cycle the fans on heating.

The most common location of the console unit is beneath the window in the exterior wall. The unit is designed to operate with a short duct connection to the outside for condenser air. One of the present models being offered is suitable for mounting either below the window with an air duct directly through the wall, or in front of the window (taking only 6 inches of window height) with the duct in the window opening. The console may be wall hung, or mounted on a floor stand. It may also be partially recessed although this is usually for new construction only.

The heating coil furnished with this type of unit can be suitable for use with either steam or hot water. A hot water system is usually the most practical for motel applications. In cold climates where the heating coil alone is not sufficient, baseboard radiation or wall hung finned tube with a decorative cover may be used, in conjunction with the unit, to provide the required capacity.

A centrally located hot water boiler with boiler water temperature adjusted by an outdoor air temperature control, is usually employed to provide hot water for the heating equipment. In new motel construction, the water piping may be run below the slab, in a pipe trench, or in the wall itself. In old construction, it may be possible to replace gravity convectors on the existing hot water or

steam system with the console air conditioners with heating coil. Otherwise, running the necessary piping is costly, and may involve extensive cutting and patching.

## SUMMER COOLING ONLY

Systems to provide summer air conditioning only are common in the Southern areas, where a separate heating system of small capacity, or none at all, is required. These systems are also applicable to existing construction where it is not desirable to replace the existing heating system. An air system or individual room air conditioner system would also be used in new construction where heating is to be done by hot water radiant floor or ceiling panels.

### Individual Room Fan-Coil Units

The fan-coil unit is adaptable to individual room use with either a chilled water or direct expansion refrigerant system. A fan-coil unit installed beneath a window is shown in **Fig. 6.**

A chilled water system, as described earlier under Year-Around Systems, is most satisfactory when an appreciable number of guest rooms are to be air conditioned. When a small motel, or small segments (up to about 5 or 10 rooms) of a larger motel are to be air conditioned, a direct expansion fan-coil system may be suitable. However, refrigerant piping problems such as oil return, insulation requirements, and possible leaks with loss of refrigerant must be considered with an extensive multiple evaporator system. Refrigerant may be supplied to the direct expansion fan-coil units from a condensing unit (compressor and air-cooled, evaporative, or water-cooled condenser).

Control of chilled water fan-coil units is similar to that described under Year-Around Systems except that the controls would be selected for cooling only and the summer-winter changeover requirement is eliminated. Controls for the direct expansion fan-coil system usually consists of a refrigerant solenoid valve and thermal expansion valve at the inlet of the unit coil. The solenoid valve is required, and the control wiring must be so arranged to interrupt refrigerant flow whenever the fan is turned off to prevent coil frosting. A wall mounted thermostat or a bulb-type thermostat in the return air to the unit should be used to control the solenoid valve, or both the fan and solenoid valve, for room temperature control.

For summer cooling only, a fan-coil unit furred in above a closet or suspended from the ceiling is, for most applications, entirely adequate.

### Air System (Central Source)

Where summer cooling only is needed, this requirement can be handled with air in the same manner as covered under all air year-around systems. The only change would be the omission of heating facilities in the air handling equipment and system.

### Individual Room Air Conditioner

The room air conditioner has, in the past, been used extensively for air conditioning motels, especially those existing units which found it necessary to offer air conditioning because of competitive pressure. Through-the-window (or wall) installations, while not particularly

**Fig. 5. Wall mounted console type room air conditioner recessed in the wall.**

pleasing to the eye from the exterior, did, and do today, supply a relatively easy and less costly way of air conditioning in the existing motel. More compact models are currently available which do not project as far out of wall or window as do the other types. Installation and servicing of these models is less convenient, however. Some manufacturers have recently introduced newly designed console models, Fig. 5, which are hung on the wall inside the room. Air for the condenser in these models is ducted either through the window or through the wall behind the unit.

Since the room air conditioner requires outside air for condensing, its location in the motel room is limited to an exterior wall. Further, the room air conditioner evaporator and condenser fans are designed to operate at but little or no external static pressure. Even a short length of duct work can substantially reduce unit capacity. This indicates that in lieu of an exterior projecting installation, the unit could be installed projecting into the room, as far as the particular design will allow, at or near ceiling level. The arrangement of the room will dictate the location of the unit, which may be above the entrance door, or above the alcove between the bath and closet. The unit discharge louvers must be such as to project the air out into the room.

Room air conditioners are available with manual control of fan speed and unit operation, and sometimes include a return air thermostat. If the unit is out of reach of the room occupant, remote control means must be provided.

The noise level of a room air conditioner may possibly be a consideration with such a system. Because it includes a compressor and two fans, almost invariably its noise level is above that of a fan-coil unit of comparable capacity. Room air conditioners of recent design are, however, quieter than their predecessors.

Reverse-cycle room air conditioners operating on the heat pump principle may, in certain areas, provide sufficient heating capacity to make further heating means unnecessary. However, this feature is of very limited use in the great majority of cases, except for standby or intermediate season duty.

### Need for Winter Heating Means

Depending on climatic conditions in the particular locality, summer cooling may be the important consideration, but it also may be necessary to provide a moderate amount of heat to the room during unseasonable weather. Usually the expense of a central heat source is not war-

**Fig. 6. Fan-coil unit installed beneath a window in motel guest room.**

ranted in such cases, and individual room heaters may be advantageously used.

Small gas-fired wall heaters or electric heating devices have been used for these applications. The choice is usually governed by economics or the availability of gas service.

Gas-fired wall heaters using natural, manufactured or LP fuel gas are usually built into the wall with the front flush with the wall surface. They are a type of radiant heater having sufficient insulation (or circulating air acting as insulation) to prevent overheating of the casing. Gas-fired wall heaters are usually vented, and in many areas, state and local codes are in force governing not only the manner in which these appliances are installed (for example, connection to a flue), but also the extent to which they must be equipped with reliable safety devices. Another point to the considered might be the architect's or owner's objection to a flue from each room protruding through the roof.

Electric heating is desirable in that the units are usually smaller and simpler in construction, are easy to control, and do not require venting or flues. The electric devices may be radiant wall or ceiling panels or baseboard heaters. Electric baseboard heaters, a comparatively recent development similar in outside appearance to hot water baseboard convectors, heat the air by gravity convection plus the radiant effect from the casing. They are unobtrusive, and lend themselves well to motel applications.

Control for these auxiliary heating units is usually of the simple manual on-off type, with no attempt being made to provide automatic control except safety devices within the unit itself.

### Control Methods

In the discussion of various types of systems, control methods for each system were mentioned, with emphasis on the desirability of individual room control. This aspect of motel air conditioning system design must not be overlooked, since the room occupants' individual prefences with respect to room temperatures are certain to vary. There is also much to be said for the use of a wall mounted thermostat rather than manual control at the unit or air volume control at the discharge grille. A wall type thermostat is familiar to most people, and detailed operating instructions are unnecessary. In addition, it is a simple control.

It may be argued, and justifiably so, that somewhat expensive and elaborate control arrangements are unwarranted in the typical motel. The final selection of a control arrangement must depend on the type of system, the judgment of the design engineer, and the desires and financial considerations of the owner.

## COMPARISON OF VARIOUS SYSTEMS

The following presentation outlines general comparisons of the three most common motel air conditioning systems. These comparisons are included in an attempt to summarize system characteristics, which, it must be noted, are apt to vary with respect to one another depending on the particular architectural design of the motel, the equipment of various manufacturers, and local labor, power, and water rates.

### Fan Coil Units on Water System

*Advantages*

1. Relatively close control of room conditions possible.
2. Service on refrigeration machinery confined to central equipment room. Room maintenance required only on filters and controls.
3. Direct supply and control of outside air to each room possible.
4. Individual room control of temperature and air quantity easily provided.
5. Most flexible system with respect to room loading, room arrangement, and unit location.
6. One of the quietest systems in operation.
7. No air recirculation from one room to another.
8. Requires less total installed refrigeration capacity.

*Limitations and Disadvantages*

1. First cost high.
2. Difficult to locate to best advantage where large glass windows extend to the floor in colder climates.
3. Not easily installed at outside walls in existing construction.

### All-Air System

*Advantages*

1. Service on refrigeration and air handling machinery confined to central equipment room. Room maintenance required only on controls.
2. Lowest initial cost for equipment and installation in new construction (for single duct systems). In existing construction, installation costs may be higher than in new construction.
3. Requires less total installed refrigeration capacity.

*Limitations and Disadvantages*

1. Individual room control difficult to achieve except at considerable expense.
2. Performance on heating poor unless outlet is placed below window.
3. Double duct type systems have high first cost.
4. Without effective individual room control, maintenance of stable room conditions is poor.

### Room Air Conditioner System

*Advantages*

1. Initial investment in equipment is low.
2. Installation is not complicated in either new or old

construction. If a year-around system is required, installations are easy in new construction or where existing hot water piping can be utilized.
3. Individual room control is provided.
4. Equipment has higher salvage value.

*Limitations and Disadvantages*

1. High operating costs.
2. Maintenance of room conditions only fair.
3. Maintenance and servicing extensive due to the many individual refrigeration systems.
4. Shorter equipment life may be expected.
5. Requires greater total installed refrigeration capacity.

## ESTIMATION OF COOLING LOAD

Standard industry practices should be followed in estimating the cooling required for a motel. The following will briefly outline these practices in general, and will also include references to motel cooling load estimation.

A cooling load estimate should be prepared for each type of room based on peak design conditions for the exposure for the purpose of selecting room units and sizing pipe or ducts. The cooling load for sizing the refrigeration equipment should be based on the maximum instantaneous load on the complete building, not on the addition of all the peak room loads. This will be discussed in more detail.

Rooms which are alike in size, occupancy, construction, orientation and exposure may be determined from inspection of the plans. Of course, only one estimate need be made for each type of room.

Selection of the proper outside and inside design dry bulb and wet bulb temperature may be made from tables of recommended summer design conditions. Outside design conditions vary with the locality. Inside design conditions are sometimes determined by the owner's preferences but standard practice ordinarily indicates a maximum of 80 deg F dry bulb, 67 deg wet bulb (50% relative humidity) for most areas of the country. However, 78 deg DB and 50% RH would be a better inside condition for design purposes.

### Room Exposure

Orientation and exposure of the room are important considerations in load estimation. The orientation of the motel is usually fixed with respect to the highway on which it is located, but it may be possible for the architect to arrange his design to take advantage of a northern or southern exposure of major glass areas, thus reducing sun load on the windows. It may also be seen that a back-to-back arrangement of room, Fig. 1a, leaves only one wall exposed to ambient temperatures, as opposed to the two exposed exterior walls in the side-by-side arrangement, Fig. 1b.

Building design and construction affect the cooling load to a large degree, and therefore it is important to consider this when the motel is still in the design stage. Fortunately, most one story (and many two-story) motels are designed with a wide covered walkway running in front of the rooms. In most cases, this serves to shield much of the room glass and wall area from direct sunlight during most of the day, thus cutting down the cooling required. Even with this protection, the large glass area of the modern motel room results in appreciable heat transmission which can be reduced only by reduction of the glass area itself, or by double glazing.

Much of the heat gain in a motel room is transferred to it through the roof. Insulation is normally used, and 4 in. of bulk type insulation or its equivalent is recommended. A ceiling with 4 in. of insulation will permit only one-eighth of the roof heat to pass through as compared with an uninsulated ceiling.

Since most motels are built on a concrete slab on ground, heat gain from the floor is not considered with this type of construction. Heat gain from the floor is also not considered for a second-story motel room with a conditioned space below.

Introduction of outside air for ventilation purposes is not often found in motel air conditioning systems, except those motels of the central corridor type where there are no doors from each room to the outside. In these cases, an allowance of 25 cfm of ventilation air per person is usually adequate. Normally infiltration through the window and door cracks due to wind pressure, plus that occurring when the door is opened, is sufficient to provide most ventilation needs. Outside air, whether taken in mechanically through the air conditioning apparatus, or introduced into the room by natural means, should be accounted for in the preparation of the cooling load estimate.

The heat gain from each person occupying the motel room can be estimated to be 200 Btu per hr sensible heat, and 250 Btu per hr latent heat. Most motel rooms are set up for a normal occupancy of two people.

### Lighting Load

The amount of lighting furnished for the motel room is not usually a great amount, but it does vary with each job. More expensive motels can be expected to have a greater number of lights. In lieu of any established figures, a total lighting load of 2.0 Btu per hr or 0.6 watts per square foot of the average guest room could be used. Sometimes motels are furnished with television sets or radios, and it is well to allow for sensible heat gain from these sources. For an average 21 in. television set, 625 Btu per hour can be used for the heat gain, and 50 Btu per hr can be used for the heat from a typical small 5-tube radio. If a fan-coil unit is being considered for the room, the heat gain due to the fan motor should be taken into account. This is usually on the order of 270 to 340 Btu per hr (80 to 100 watts) for a small fan-coil unit.

The sensible heat from the fan motor is a continuous load on the refrigeration system, but the sensible and latent heat gain from people, and the sensible gain from lights, television sets, or radios are not. The latter heat gains may be carried at less than 100% of value on the peak load cooling estimate, since they usually do not occur simultaneously at the time of peak load. Taken at 100% value, these gains alone will require over 8 tons refrigeration capacity in a typical 50-unit motel. It is, therefore, advantageous to apply usage factors to them to reduce this requirement.

Automatic room temperature control on the guest room units or central station unit will permit the system to run continuously subject to the demand of the thermostat 24 hours a day. This is advantageous in that it will allow a credit for thermal storage to be taken on the cooling load estimate. Whenever the temperature of materials in

the motel room, such as walls, floor and furniture, may be reduced below the peak load maximum room temperature (inside design temperature) a credit to room sensible heat due to thermal storage may be realized. This implies a precooling period prior to the peak heat gain, during which time the room air temperature is maintained appreciably below its maximum, thus removing heat from the exposed materials. During the peak load period, the room temperature rises above the temperature of the precooled materials so that these now serve to aid in removal of heat from the room air. Since the duration of peak load for most motels is concentrated in about 4 hours in late afternoon and early evening, credit for storage may be included when automatic room temperature control arrangements are used, and are kept operative with the control point set at least 4 degrees below the design maximum room temperature. The storage effect credit available for a typical motel room with a 16-hour precooling time and a 4-hour peak has been calculated to be 3 Btu per hr per sq ft of floor area during the 4-hour peak.

As was mentioned previously, a cooling load estimate should be prepared for each room based on peak design conditions for each exposure. The peak design load is used in selecting room units and sizing pipe or ducts. The cooling load for selecting refrigeration equipment for central station systems should be based on the maximum instantaneous load on the complete building, not on the summation of the room peak loads. The maximum instantaneous load on the complete building is less than the summation of the room peak loads because all of the rooms in a motel will not peak at the same time. Usually estimates are prepared for 2 or 3 different times; for example, 4 and 6 p.m. At 4 p.m. it might be assumed that the motel will be only 20% occupied by guests and that no lights or TV sets will be in use. The sun angle on the West wall is such that most of the glass is shaded. At 6 p.m. the motel might be 80 per cent occupied, bathroom lights and television sets are on, and the sun angle is such that most of the West glass is sunlit. By adding the estimated cooling requirements for each of the rooms at 4 p.m., and comparing it with the summation of room loads at 6 p.m., the time and the magnitude of maximum design load on the building can be established.

When individual room air conditioners (self-contained units) are to be installed, the maximum instantaneous heat gain of each room should be used when sizing the required units.

### Bathroom Heating

Provision for heating of the bathroom by means other than the unit or outlet placed in the bedroom area should always be considered when the bath is located on an outside wall, as in Figure 1B. Where the bath is located entirely within the interior of the building, an estimate of the heat loss will indicate whether or not it is necessary to provide additional heat. As a general rule, motel baths in Northern climates usually require additional heat, but in Southern climates it is usually not necessary for interior baths.

When a hot water system with fan-coil units in each room is used, individual bathroom convectors or radiant floor panels are logical choices for bathroom heating equipment. Small convectors are available which may be recessed into the wall if floor space is a consideration. The radiant panel may be enclosed in the slab as a separate grid for each bathroom or cluster of bathrooms, as in the back-to-back room arrangement shown in Fig. 1A. The panel may also take the form of continuous lengths of piping running the full length of the wing beneath the bathrooms and a portion of the bedroom area, with space at the ends of the run for headers plus an allowance for expansion and contraction.

While a manual control valve accessible to the occupant could be placed on each bathroom convector, it is usually better practice to control the supply water temperature to the convector from the same outdoor compensator used for the room unit hot water supply. If a floor panel is used, automatic compensation of supply water temperature is always required. Supply water should be supplied to the floor panel at a temperature between 100 and 110 deg F. A separate supply main should always be run to the bathroom hot water heating equipment so that it may be closed down when the cooling cycle is in operation.

If an all-air system is used for air conditioning the motel, a small branch duct may be run to each bathroom to provide heating. When a fan-coil unit is furred in at the ceiling near the bathroom, a small branch duct may be run off the discharge duct at the unit to supply heated air directly to the bathroom.

Depending on the amount of heat required, it may be more advantageous to install electric radiant wall panels or gas wall heaters to take care of bathroom heating requirements.

### Other Rooms and Buildings

Many motels include a conference room, management offices, a lobby or waiting room area. These plus a restaurant building may be included in the plans for air conditioning. These special purpose areas are not considered in this article for it may be desirable to design a separate system for these rooms, because of the special treatment often required and the nature of the load.

Some of these areas could advantageously be included in the chilled water system, if used, but this may be uneconomical if the building containing these spaces is detached to any great extent from the guest room areas.

# DETAILS OF TYPICAL MANHOLES

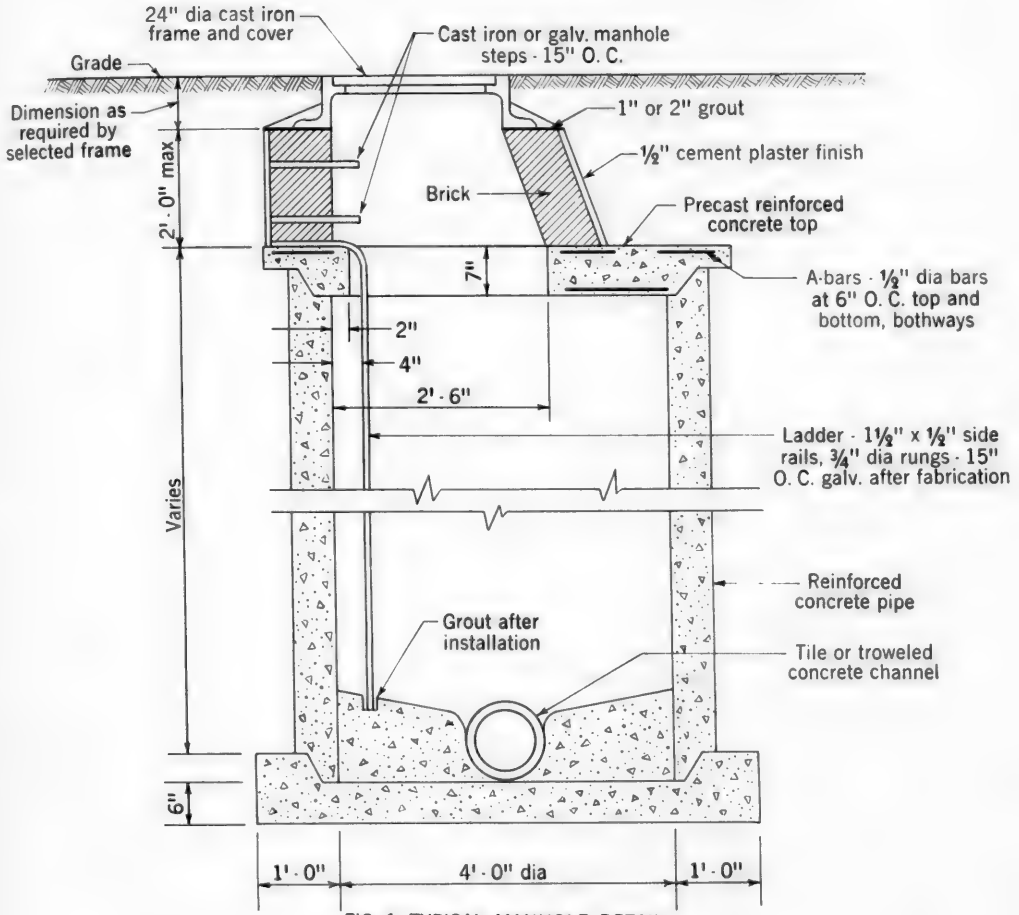
24" dia cast iron frame and cover
Cast iron or galv. manhole steps - 15" O. C.
Grade
Dimension as required by selected frame
2' - 0" max
1" or 2" grout
½" cement plaster finish
Brick
Precast reinforced concrete top
7"
A-bars - ½" dia bars at 6" O. C. top and bottom, bothways
2"
4"
2' - 6"
Ladder - 1½" x ½" side rails, ¾" dia rungs - 15" O. C. galv. after fabrication
Varies
Reinforced concrete pipe
Grout after installation
Tile or troweled concrete channel
6"
1' - 0"
4' - 0" dia
1' - 0"

FIG. 1. TYPICAL MANHOLE DETAIL

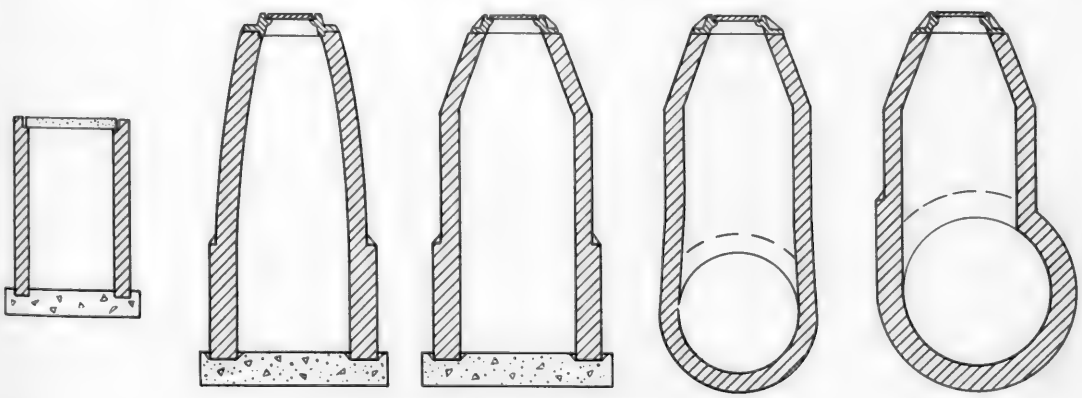

FIG. 2. VARIOUS SHAPES OF MANHOLES

# DETAILS OF TYPICAL MANHOLES

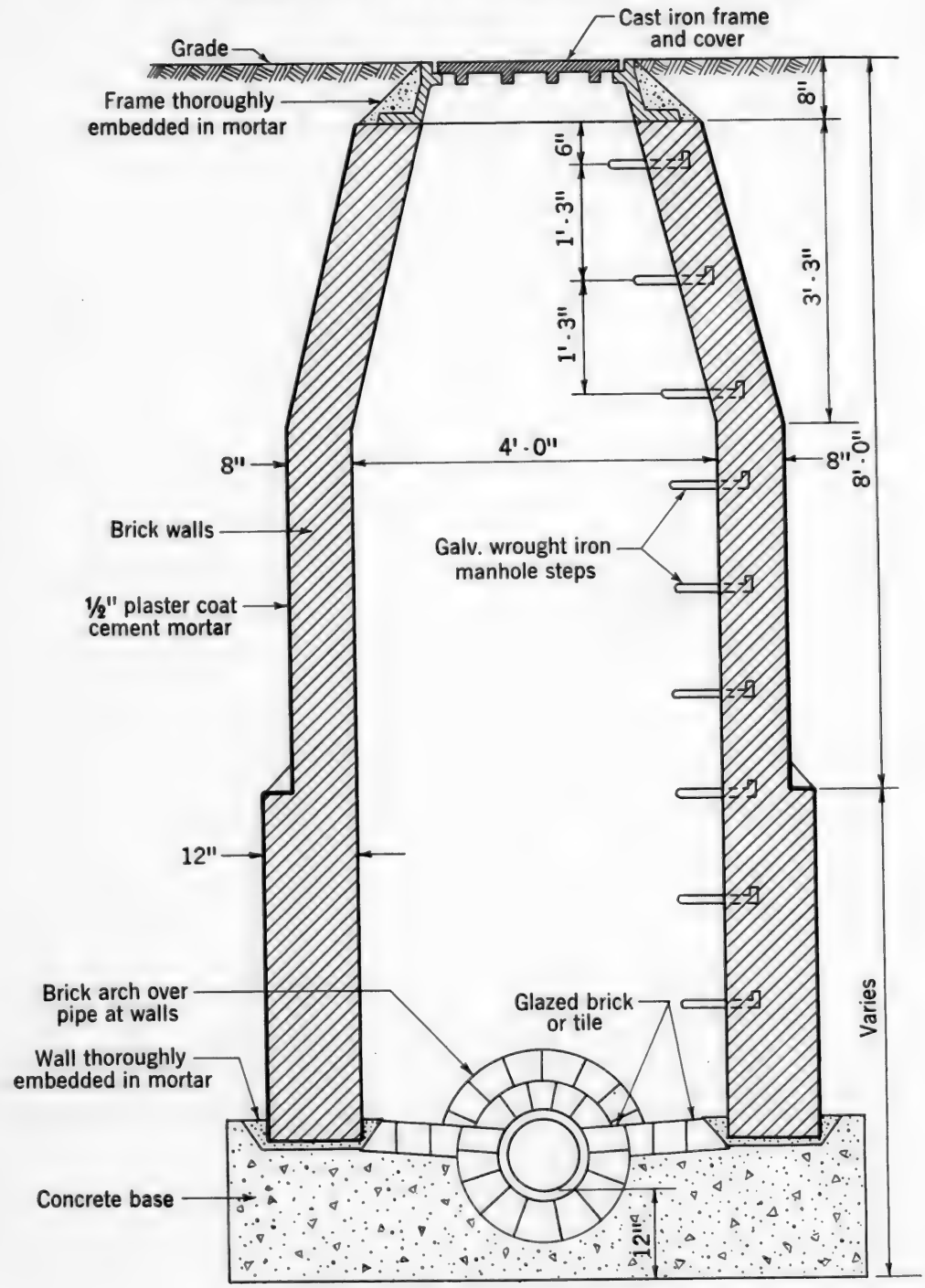


FIG. 3. DETAIL OF TYPICAL MANHOLE

Fig. 1, Courtesy of James C. Church of Syska & Hennessy, Inc.
Fig. 2 and 3. Courtesy of Louis Blendermann.

# Air Density Calculator

## Gives fan data in one-fourth the time

GUY JOHNSON, JR.

Assistant Professor of Mathematics, Rice Institute, Houston, Texas

**The three dials reproduced on these pages are designed to be cut out and assembled to make a working circular slide rule calculator. Devised at Texas Engineering Experiment Station's fan testing laboratory at College Station, Tex., the calculator enables one to compute moist air density for fan data in one-fourth the time previously required, and with good accuracy. Its operation is explained.**

ACCURATE computation of moist air density is essential in both fan research and routine fan testing. Values of air density are tabulated in the Standard Test Code adopted by the National Association of Fan Manufacturers, but interpolation with consequent loss of time and accuracy is usually required in their use from this source.

Since testing fans for design, improvement, and certification is an extensive activity at Texas Engineering Experiment Station, a detailed study was made of various means by which air density could be calculated from a knowledge of barometric pressure, dry bulb temperature, and wet bulb depression. This resulted in the design and construction of a circular slide rule calculator. With it one can calculate air density from air pressure in inches of mercury and dry bulb and wet bulb temperatures in degrees Fahrenheit.

This calculator is based on an equation stemming from the perfect gas formula with atmospheric pressure being given a median value of 29.5 inches of mercury. The equation is

$$\rho = p_a - 0.375\ [p_w - 0.011092\ (t_d - t_w)]/R''\ T_d$$

in which

$\rho$ = density of moist air, lb per cu ft,
$p_a$ = atmospheric pressure, inches of mercury,
$t_d$ = dry bulb temperature, deg F,
$T_d$ = dry bulb temperature, deg R,
$t_w$ = wet bulb temperature, deg F,
$p_w$ = saturated vapor pressure, inches of mercury, at $t_w$, and
$R''$ = gas constant for dry air, 0.75430 (cu ft) (inches of mercury)/(lb) (deg R), based on the work of John A. Goff and S. Gratch.

The constant 0.011092 involves an approximation for atmospheric pressure. A median value of 29.5 inches of mercury was assumed. This approximation involves a maximum error in moist air density of $\pm$ 11 $\times$ $10^{-6}$ lb per cu ft at the extremes of the ranges of barometric pressures.

Use of the slide rule is restricted to these ranges: barometric pressure, 28.5 to 31.0 inches of mercury; dry bulb temperature, 60 to 110 deg F; and wet bulb depression, 0 to 20 deg F. Within these ranges density values obtained by use of this circular slide rule were within $\pm$ 50 $\times$ $10^{-6}$ lb per cu ft, within approximately 0.7%, of those obtained from the Goff-Gratch formulation of the properties of moist air. In addition, use of the slide rule has reduced air density computation time for a normal fan test from 40 to 10 minutes.

As a further timesaving feature the calculator has two scales to give correction factors for standard air density, 0.075 lb per cu ft. These factors, $0.075/\rho$ and $(0.075/\rho)^{1/2}$ are used in the calculation of fan performance from test data.

There are indications that the calculator could be used successfully in other applications where a large number of air densities are to be calculated within its accuracy limits. Since its inception, it has been in use at the Texas Engineering Experiment Station's fan testing laboratory. First to be approved by Air Moving and Conditioning Association (AMCA) as a qualified neutral laboratory for testing centrifugal fans in accordance with the Association's Standard Test Code and Laboratory Standards, the laboratory has been in operation since 1939 for research and development of mechanical air moving equipment. Centrifugal fans up to and including a double width, double inlet type with discharge duct diameter of 50 inches may be tested there.

### How to Construct the Calculator

With scissors, cut out the two dials, Fig. 1 and Fig. 2. Remove *entire page* containing the third dial, Fig. 3. Place the smaller of the two dials, Fig. 1, on top of the larger of the two, Fig. 2, and the larger on top of the dial which is not cut out, Fig. 3.

A hair line device, as illustrated on the last page of this article, may be constructed of any clear plastic. An alternative is a semi-circle as illustrated in Fig. 4, cut out of light cardboard or sheet metal.

Place hair line device (or its substitute) on top of smallest dial (Fig. 1) and fasten all four pieces through centers with rivet, bolt, or other small, round, fastening device. Centers are marked for good alignment.

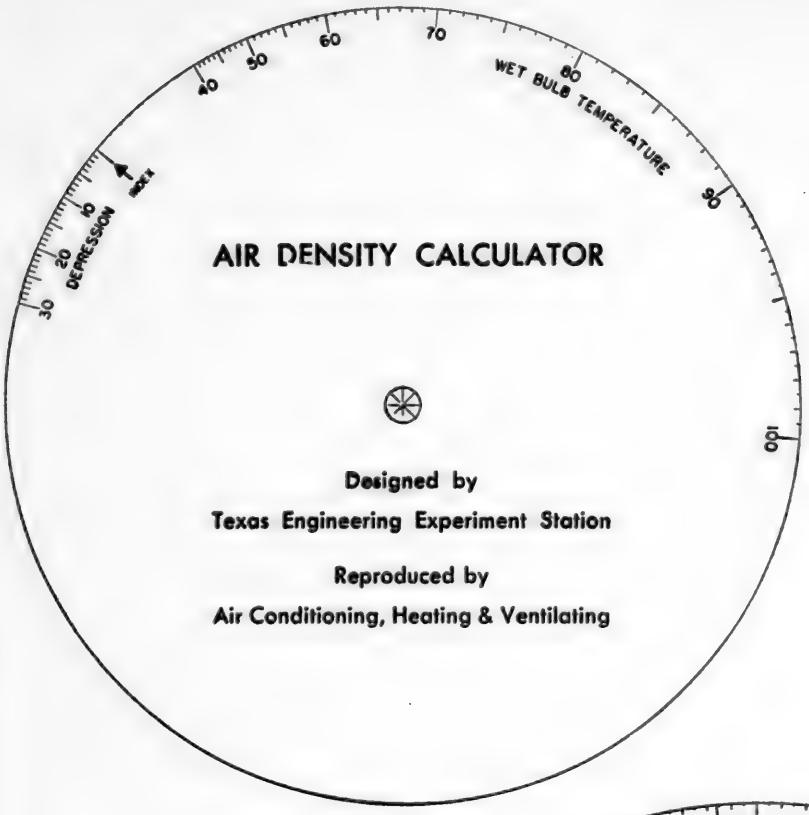
WET BULB TEMPERATURE
40
50
60
70
80
90
100
DEPRESSION
INDEX
10
20
30
AIR DENSITY CALCULATOR
Designed by
Texas Engineering Experiment Station
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FIG. 1

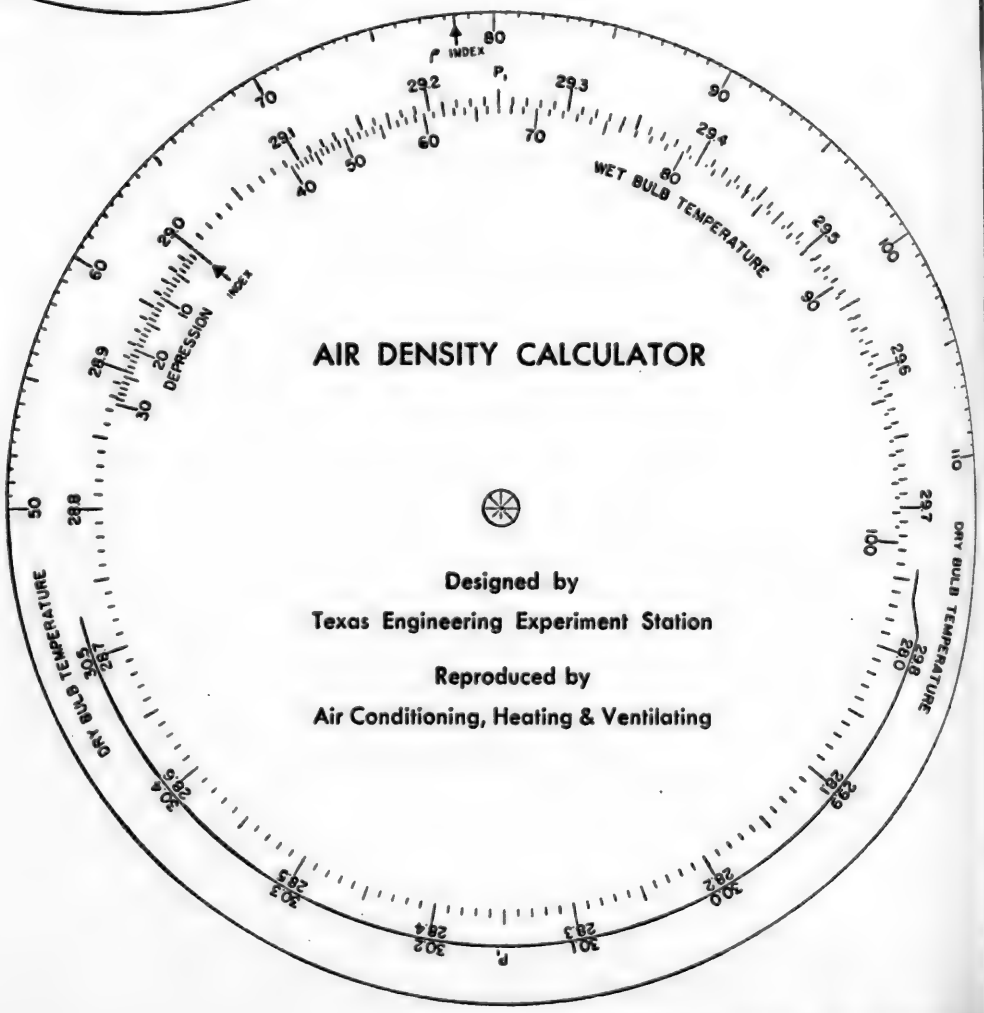
P INDEX
P1
WET BULB TEMPERATURE
DEPRESSION
INDEX
DRY BULB TEMPERATURE
AIR DENSITY CALCULATOR
Designed by
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FIG. 2

Dr. Guy Johnson, Jr., inventor of the slide rule air density calculator, is presently assistant professor of mathematics and advisor to men at Rice Institute, Houston, Tex., where he received the Ph.D. degree and has been a member of the faculty since 1954. Other degrees of Dr. Johnson include a B.S. in mechanical engineering from A. & M. College of Texas (1943), an M.B.A. in business administration from Harvard (1947), and an M.S. in mathematics from A. & M. College of Texas (1952). Prior to joining the faculty at Rice Institute, and after service as a field artillery officer in World War II, he was successively employed on the engineering staff of J. & S. Carburetor Co., Dallas, the administrative staff of Southern Aircraft, Garland, Tex., and the faculty of the Department of Mechanical Engineering of A. & M. College of Texas, and the research staff of the Texas Engineering Experiment Station.

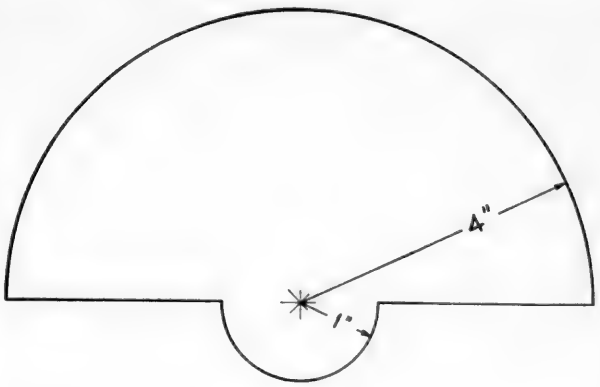



FIG. 4

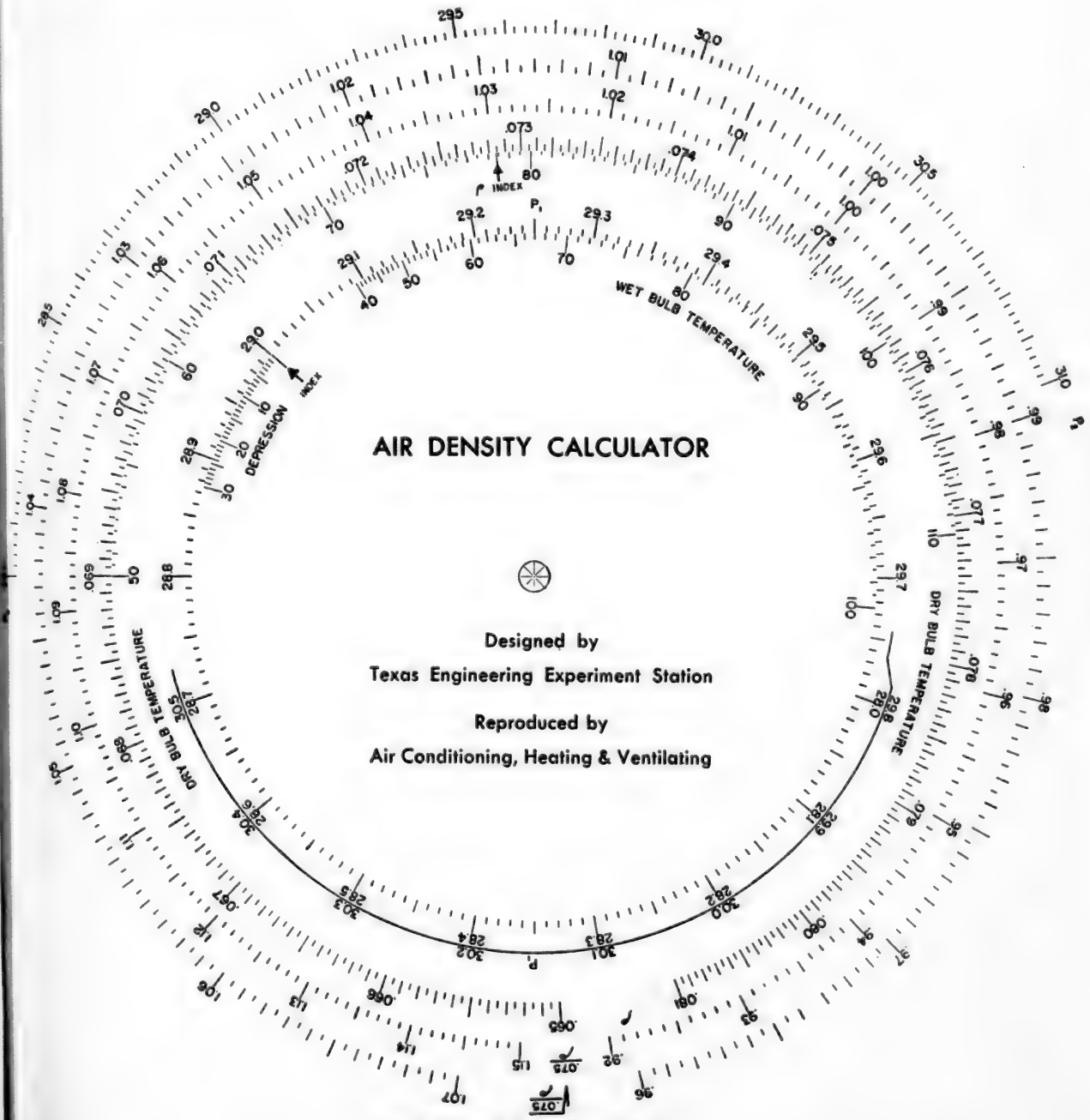
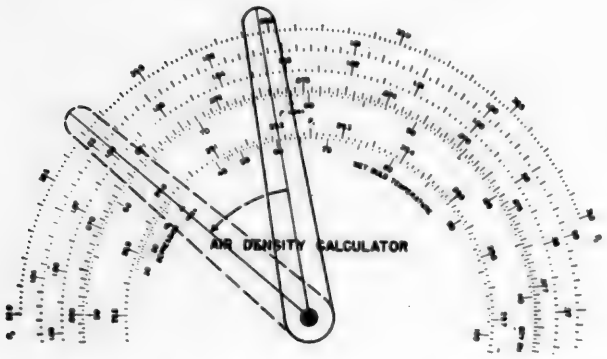
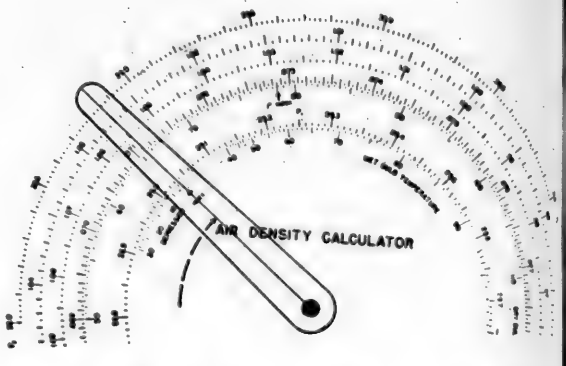



FIG. 3—DO NOT CUT OUT

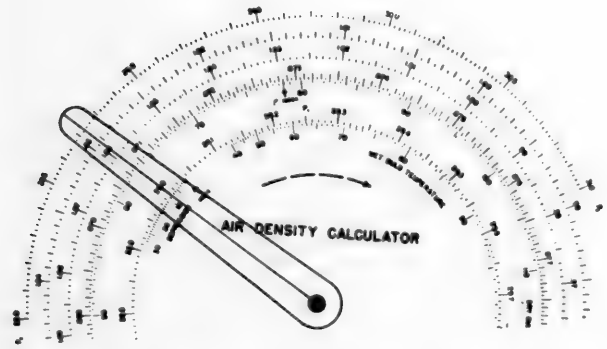
*Problem:* To find air density, given barometric pressure of 29.20 inches of mercury, wet bulb temperature of 60.7 deg F, and dry bulb temperature of 68.8 deg F. Wet bulb depression is 68.8 — 60.7 = 8.1 deg F.
*Solution:* Follow steps 1 to 4.



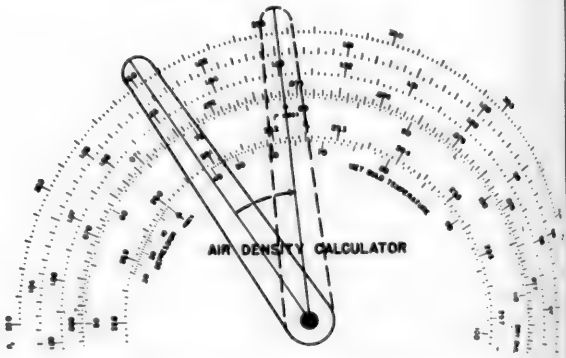

*Step 1.* Under hair line set barometric pressure (29.20) opposite wet bulb temperature (60.7). Move hair line over INDEX.




*Step 3.* Move hair line to INDEX and read indicated barometric pressure (29.034).




*Step 2.* Hold hair line over indicated barometric pressure (29.00), then move inner dial to right until wet bulb depression (8.1) is under hair line.




*Step 4.* Transfer indicated barometric pressure (29.034) to $P_s$ scale on outer edge of rule. Align hair line over this pressure. Move dry bulb temperature (68.8), middle dial, under hair line. Move hair line to index and read $\rho$ = .07284 lb per cu ft, $.075/\rho$ = 1.0297, $\sqrt{.075/\rho}$ = 1.0147. Notice that $\rho$ scale increases to the right and that the $.075/\rho$ and $\sqrt{.075/\rho}$ scales increase to the left.

## Quick Reference Table for Chilled Water Supply

In chilled water calculations, the following table can save repeated divisions in converting tons of refrigeration to gallons per minute of chilled water. It is based on the fact that one ton is 200 Btu per minute, that 1 Btu will raise 1 lb of water 1 deg F, and that one gallon of water weighs 8.345 lb. The result is the constant 24 gpm per ton per deg, or gpm equals 24 × tons/deg rise, or gpm/ton equals 24/deg rise.

**QUICK REFERENCE FOR CHILLED WATER SUPPLY**
*(Courtesy Admiral Engineering Company)*

| Water Temp. Rise, deg F | Gpm/Ton Required | Water Temp. Rise, deg F | Gpm/Ton Required |
|---|---|---|---|
| 1 | 24. | 7 | 3.42 |
| 2 | 12. | 8 | 3. |
| 3 | 8. | 9 | 2.66 |
| 4 | 6. | 10 | 2.4 |
| 5 | 4.8 | 11 | 2.18 |
| 6 | 4. | 12 | 2. |

*Example 1:* To find total system gpm when 43-deg leaving water with 5-deg temperature rise is required for a total loading of 24.2 tons: Opposite 5-deg temperature rise in table, read 4.8 gpm/ton.

24.2 tons × 4.8 gpm/ton = 116.16 gpm

*Example 2:* To find tons when total gpm (150) and temperature rise (8 deg) are known: Opposite 8-deg temperature rise in table, read 3 gpm/ton.

150 gpm/3 gpm per ton = 50 tons

# Water Supply and Drainage Quantities for
# Radioactivity Laboratories

JOHN M. RUDDY

Chief Engineer
Architectural Planning Division
Brookhaven National Laboratory

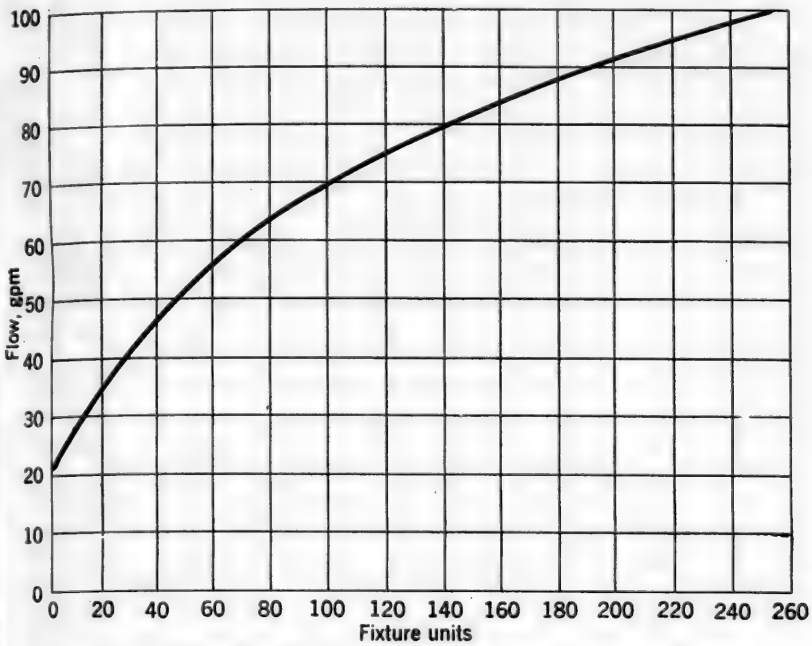



Fig. 1. Load for Class A occupancy per National Plumbing Code.

**Usual design criteria for liquid waste flow were found to be unreliable at the Brookhaven radiation laboratories. New data, based on recorded usage in several laboratory buildings, are presented.**

EARLY experience with laboratory liquid waste effluent at Brookhaven National Laboratory indicated that there were large variations between actual and predicted flow quantities. Volumes had been computed by the usual design criteria based on the use of the standard fixture unit method using number of fixture units for standard sinks. The differences from ordinary flows were both smaller and larger, depending on the type of laboratory. Volumes of liquid waste from "medium and high level" work areas, which used radioactive materials in some quantities, were very much lower than had been expected, probably because of extra care in water usage, since the liquid waste was usually held up in tanks. On the other hand, the volumes from the more ordinary "low level" type laboratories were very much higher than expected because of the extensive use of aspirators and cooling water for small experiments.

Arrangements were made beginning in 1950 to record hot and cold water usage in several laboratory wings and buildings, and at the same time to ascertain the number of personnel using these facilities. In addition, spot checks were made from time to time on effluent flow in connection with neutralization and sampling operations. A condensed tabulation of the data derived is shown in Table 3.

Averaging various laboratory effluent rates with weighted rates of daily peak, average, and maximum flows at the main sewage disposal plant, indicated that a general average of 1 gpm per person per 8 hour working day would be a reasonable basic empirical design figure. This permitted the establishment of the number of fixture units shown in Tables 1 and 2.

To establish the flow in gallons per minute from numbers of fixture units, the National Plumbing Code chart for "Load for Class A Occupancy" was found to fit Brookhaven laboratory conditions more closely than any of their other charts. This chart is presented as Fig. 1. These criteria have been tested by several years of use and seem to be satisfactory for radioactivity laboratories provided that aspirator and cooling water usage is not greatly above average and that all laboratory wastes are in a common drain.

Data for design are divided into three categories: (1) hot and cold water piping; (2) laboratory waste piping; and (3) sampling and holdup tank sizing.

### Hot and Cold Water Piping

Branch lines for groups of fixtures, individual laboratory rooms, and similar groupings should be sized in accordance with the following:

1. One-half (½) the sum of the fixture units as shown in Table 1 for all fixtures of group equal the number of fixture units for the group. This allows ±25% for future fixture connections.
2. Flow in gpm for sizing lines should be established from Fig. 1 which shows flow in gallons per minute for a number of fixture units.
3. Size piping in accordance with standard practice.

Mains and sub-mains should be sized as follows:

1. The sum of the fixture units for all fixtures supplied is converted to gallon per minute flow by use of Fig. 1. This allows ±50% for future extensions and connections.
2. Size piping in accordance with standard practice.

## TABLE 1—HOT AND COLD WATER PIPING

| | Number of Fixture Units[1] | Minimum Pressure at Fixture, psi | Minimum Flow at Fixture, gpm |
|---|---|---|---|
| Laboratory Sink | 3 | 8 | 3 |
| Aspirator Supply | 10 | 30 | 10 |
| Cup Drain Supply | 2 | 8 | 2.5 |
| Slop Sink | 5 | 8 | 5 |

[1] Fixture unit is same as defined in National Plumbing Code. Minimums are Brookhaven National Laboratory laboratory experience.

## TABLE 2—LABORATORY WASTE PIPING

(Fixture unit is as defined in National Plumbing Code)

| Service | No. of Standard Fixture Units |
|---|---|
| Cup drain | ½ (no more than 3 in simultaneous use in one room at one time) |
| Lab sink, to 10 in. deep | 1 |
| Lab sink, over 10 in. deep | 2 |
| Floor drain, 3 in. | ½ |
| Dishwasher, 1½ in. trap | 1 |
| Safety shower | (No floor drain) |
| Shower, adjoining lab. | ½ |
| Slop sink, used only at night | 1 |

### Laboratory Waste Piping

All slop sinks in laboratory areas should be connected to laboratory waste system to control radioactivity during "spill" cleanups. It is also necessary to lay out laboratory waste systems separate from the sanitary system until after neutralizing and/or sampling so as to reduce the length of acid resistant waste lines and to prevent blocking of samplers and neutralizing tanks.

Drainage lines should be sized as follows:

1. The sum of the fixture units for all fixtures served is converted to gallon per minute flow by use of Fig. 1.
2. Piping should be sized in accordance with standard practice.

### Sampling and Hold-up Tank Sizing

For neutralizing, sampling, or monitoring equipment, use the total quantities found in Table 2; reduce the waste piping design fixture units by 50% if all clean water, such as from aspirators and cooling coils, is drained in a separate system and use Fig. 1 for determining flow.

For "hold-up" tanks, use 100 gallons per day per person for waste that is normally contaminated.

The foregoing three categories of liquid waste quantities for design represent generalized averages. The designer should be particularly careful to search for and evaluate any conditions which are substantially different from the average.

## TABLE 3—WATER USAGE IN VARIOUS LABORATORY BUILDINGS

| Building, Personnel[1] and Fixtures[2] | Year | Normally Uncontaminated Waste | | Normally Contaminated Waste | | Flow in Gal. per Day per Fixture | | Gallons per Day per Fixture per Person | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Normal | | Summer | |
| | | Gal. per Day | Gal. per Min. | Gal. per Day | Gal. per Min. | Uncont. Waste | Cont. Waste | Uncont. Waste | Cont. Waste | Uncont. Waste | Cont. Waste |
| Hot Lab. | 1953 | 1400 | 2.9 | 286 | 0.60 | 8.05 | 1.65 | .18 | .037 | .16 | .033 |
| 45 S | 1954 | 5140 | 10.7 | 740 | 1.54 | 29.60 | 4.25 | .66 | .095 | .59 | .085 |
| 50 N | 1955 | 6520 | 13.5 | 735 | 1.53 | 37.50 | 4.23 | .83 | .094 | .75 | .084 |
| 174 F | 1956 | 7850 | 16.3 | 668 | 1.40 | 45.20 | 3.95 | 1.01 | .088 | .91 | .078 |
| Reactor Labs. | 1953 | 5640 | 11.8 | 935 | 1.95 | 1.58 | 2.61 | .0090 | .015 | .0067 | .0095 |
| 175 S | 1954 | 5140 | 10.7 | 740 | 1.54 | 1.43 | 2.03 | .0083 | .012 | .0052 | .0075 |
| 275 N | 1955 | 6520 | 13.5 | 735 | 1.53 | 1.84 | 2.02 | .0105 | .012 | .0067 | .0075 |
| 358 F | 1956 | 7850 | 16.3 | 668 | 1.40 | 2.20 | 1.94 | .0125 | .011 | .0080 | .0071 |
| Chemistry Labs. | 1954 | — | — | 376 | 0.78 | — | 4.95 | — | .55 | — | .49 |
| 9 S | 1955 | — | — | 510 | 1.06 | — | 6.71 | — | .75 | — | .67 |
| 10 N | 1956 | — | — | 583 | 1.22 | — | 7.68 | — | .85 | — | .77 |
| 76 F | | | | | | | | | | | |
| Biology Lab. | 1953 | 3000 | 4.0 | — | — | 6.30 | — | .105 | — | .070 | — |
| 60 S | 1954 | 6720 | 14.0 | — | — | 14.20 | — | .225 | — | .157 | — |
| 90 N | | | | | | | | | | | |
| 477 F | | | | | | | | | | | |
| Medical Labs. | 1955 | 200 | — | — | — | 1.27 | — | .026 | — | .021 | — |
| 48 S | | | | | | | | | | | |
| 60 N | | | | | | | | | | | |
| 157 F | | | | | | | | | | | |

[1] Figures in this column followed by S indicate the number of personnel in that building in summer. N indicates the normal number of personnel. For example, in the Hot Lab, 45 workers are engaged in the summer, 50 the remainder of the year.
[2] Figures in this column followed by F indicate the number of hot and cold water fixtures in that building. For example, there are 174 fixtures in the Hot Lab.

# How Many Tubes Will Fit into a Shell?

JACQUES DUTKA
Senior Engineer, Radio Corporation of America
Adjunct Assoc. Professor of Electrical Engineering,
Columbia University

**How many tubes of a given diameter can be fitted into a circular heat exchanger drum of given diameter? If we know the space needed between tubes, the problem becomes a mathematical one, that of the number of circles that can be inscribed in an enclosing circle. That depends, in part, on the way the circles are arranged. Numerical solutions are presented for the three most important arrangements and the derivation is indicated.**

SUPPOSE an arrangement of tube and shell as in Fig. 1, where $r$ is outside radius of the tubes and $R$ is inside radius of the shell. The dashed circles represent areas occupied by the tubes when their diameter is increased by the amount of clearance between tubes as calculated by the designer. For the sake of simplicity, the radius of the dashed circles will be taken as unity. Then $R$ is also the ratio of enclosing circle diameter to enclosed circle diameter.

### Case I: One-Circle Central Core

In Fig. 2 is shown cross sections consisting of single, double, and triple cores surrounded by layers of other circles in the densest possible packing. The centers of the circles form equilateral parallelograms of interior angles of 60 and 120 deg. Geometrically, the problem of finding the number of circles in a circle of radius $R$ in the first arrangement is equivalent to finding the number of vertices of parallelograms which lie in or on a circle of radius $(R\text{-}1)$ whose equation is $x^2 + y^2 = (R\text{-}1)^2$.

Derivation of the following formula belongs to the realm of the theory of numbers.* Briefly, if $N_1(R)$ denotes the number of circles within the enclosing circle of radius $R$ in the arrangement described above, then

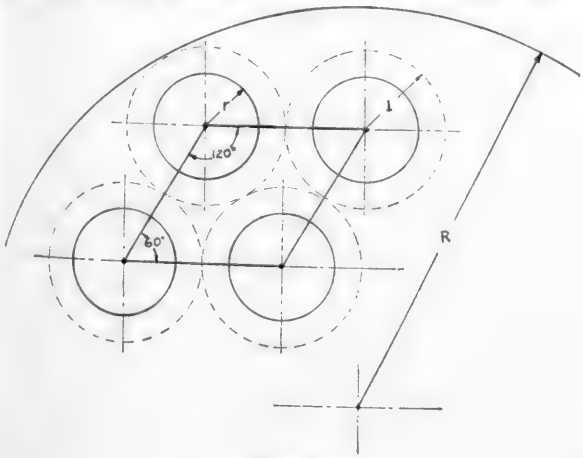



Fig. 1

$$N_1(R) = 1 + 6\left\{\left[\frac{A}{1}\right] - \left[\frac{A}{2}\right] + \left[\frac{A}{4}\right] - \left[\frac{A}{5}\right] + \cdots + \left[\frac{A}{3m+1}\right] - \left[\frac{A}{3m+2}\right] + \cdots\right\} \quad (1)$$

Here $A$ denotes the expression $(R\text{-}1)^2/4$ and $[x]$ is defined as the largest integer that does not exceed $x$. (Thus, the value of [2.35] is 2, of [25.7] is 25, etc.) Further, $m$ is a non-negative integer which assumes the values 0, 1, 2, 3. . . . The series on the right continues up to the term preceding the term in which $(3m + 1)$ or $(3m + 2)$ exceeds $A$, and then terminates.

For example, if $R$ is 5, $A = (5 - 1)^2/4 = 4$, and

$$N_1(5) = 1 + 6\left\{\left[\frac{4}{1}\right] - \left[\frac{4}{2}\right] + \left[\frac{4}{4}\right]\right\} = 1 + 6\left\{4 - 2 + 1\right\} = 19$$

which agrees with the figure in Table 1 for case I where $R = 5$.

### Case II: Two-Circle Central Core

Another arrangement in circle packing is the case where there is a central core consisting of two contiguous circles, the core being surrounded by layers of other circles in the densest possible packing, as shown in Fig. 2, center. It can be shown that the number of circles, $N_2(R)$, enclosed in a circle of radius $R$ is equal to

$$N_2(R) = 2\left\{\left[\frac{4A}{1}\right] - \left[\frac{4A}{2}\right] + \cdots + \left[\frac{4A}{3k+1}\right] - \left[\frac{4A}{3k+2}\right] + \cdots\right\} - 2\left\{\left[\frac{A}{1}\right] - \left[\frac{A}{2}\right] + \cdots + \left[\frac{A}{3k+1}\right] - \left[\frac{A}{3k+2}\right] + \cdots\right\} \quad (2)$$

where the series on the right, as before, is finite and $k$ plays the same role as $m$ in case I.

For $R = 5$ and $A = 4$, for example,

$$N_2(5) = 2\left\{\left[\frac{16}{1}\right] - \left[\frac{16}{2}\right] + \left[\frac{16}{4}\right] - \left[\frac{16}{5}\right] + \left[\frac{16}{7}\right] - \left[\frac{16}{8}\right] + \left[\frac{16}{10}\right] - \left[\frac{16}{11}\right] + \left[\frac{16}{13}\right] - \left[\frac{16}{14}\right] + \left[\frac{16}{16}\right]\right\} - 2\left\{\left[\frac{4}{1}\right] - \left[\frac{4}{2}\right] + \left[\frac{4}{4}\right]\right\}$$

$$= 2\left\{16 - 8 + 4 - 3 + 2 - 2 + 1 - 1 + 1 - 1 + 1\right\} - 2\left\{4 - 2 + 1\right\} = 14$$

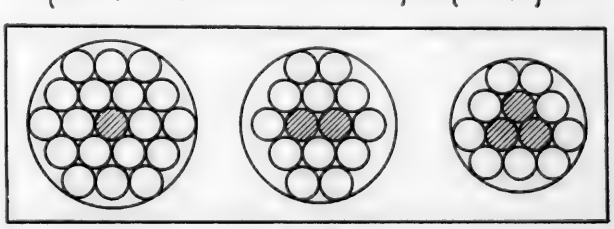


Fig. 2

*For more detailed explanation of the derivation of the foregoing formulae, see *Machinery*, October, 1956, page 246.

**TABLE I—NUMBER OF CIRCLES ENCLOSED WITHIN AN ENCLOSING CIRCLE FOR CENTRAL CORE CONSISTING OF ONE, TWO, AND THREE CIRCLES**

| $R = \frac{\text{Large Diameter}}{\text{Small Diameter}}$ (See footnote) Range of $R$ from | to (but not including) | Number of Circles Enclosed Including Core |
|---|---|---|
| CASE I: ONE-CIRCLE CENTRAL CORE | | |
| 3 | 4.464 | 7 |
| 4.464 | 5 | 13 |
| 5 | 6.292 | 19 |
| 6.292 | 7 | 31 |
| 7 | 7.928 | 37 |
| 7.928 | 8.211 | 43 |
| 8.211 | 9 | 55 |
| 9 | 9.718 | 61 |
| 9.718 | 10.165 | 73 |
| 10.165 | 11 | 85 |
| 11 | 11.392 | 91 |
| 11.392 | 11.583 | 97 |
| CASE II: TWO-CIRCLE CENTRAL CORE | | |
| 2 | 2.732 | 2 |
| 2.732 | 3.646 | 4 |
| 3.646 | 4 | 8 |
| 4 | 4.606 | 10 |
| 4.606 | 5.359 | 14 |
| 5.359 | 5.583 | 18 |
| 5.583 | 6 | 22 |
| 6 | 6.196 | 24 |
| 6.196 | 6.568 | 26 |
| 6.568 | 7.083 | 30 |
| 7.083 | 7.245 | 34 |
| 7.245 | 7.557 | 38 |
| 7.557 | 8 | 42 |
| 8 | 8.550 | 48 |
| 8.550 | 8.810 | 52 |
| 8.810 | 8.937 | 56 |
| 8.937 | 9.185 | 60 |
| 9.185 | 9.544 | 64 |
| 9.544 | 9.660 | 68 |
| 9.660 | 9.888 | 70 |
| 9.888 | 10 | 74 |
| 10 | 10.539 | 76 |
| CASE III: THREE-CIRCLE CENTRAL CORE | | |
| 2.155 | 3.309 | 3 |
| 3.309 | 4.055 | 6 |
| 4.055 | 5.163 | 12 |
| 5.163 | 5.619 | 18 |
| 5.619 | 6.033 | 21 |
| 6.033 | 6.773 | 27 |
| 6.773 | 7.110 | 30 |
| 7.110 | 7.429 | 36 |
| 7.429 | 8.024 | 42 |
| 8.024 | 8.572 | 48 |
| 8.572 | 9.083 | 54 |
| 9.083 | 9.326 | 63 |
| 9.326 | 10.018 | 69 |
| 10.018 | 10.238 | 75 |

Ratio $R$ of enclosing circle diameter to diameter of enclosed circles.

which agrees with the figure in Table 1, case II, when $R = 5$.

### Case III: Three-Circle Central Core

Where three mutually continguous circles form a central core, as in Fig. 2, right, the formula becomes

$$N_3(R) = 3\left\{\left[\frac{3A}{1}\right] - \left[\frac{3A}{2}\right] + \ldots + \left[\frac{3A}{3k+1}\right] - \left[\frac{3A}{3k+2}\right] + \ldots\right\} - 3\left\{\left[\frac{A}{1}\right] - \left[\frac{A}{2}\right] + \ldots + \left[\frac{A}{3k+1}\right] - \left[\frac{A}{3k+2}\right] + \ldots\right\} \quad (3)$$

where the series on the right is finite.

Again substituting $R = 5$ (and $A = 4$) as in the previous cases, we have

$$N_3(5) = 3\left\{\left[\frac{12}{1}\right] - \left[\frac{12}{2}\right] + \left[\frac{12}{4}\right] - \left[\frac{12}{5}\right] + \left[\frac{12}{7}\right] - \left[\frac{12}{8}\right] + \left[\frac{12}{10}\right] - \left[\frac{12}{11}\right]\right\} - 3\left\{\left[\frac{4}{1}\right] - \left[\frac{4}{2}\right] + \left[\frac{4}{4}\right]\right\}$$
$$= 3\{12-6+3-2+1-1+1-1\} - 3\{4-2+1\} = 12$$

which agrees with the figure in Table 1, Case III, when $R = 5$.

### Densest Packing of Circles

The general problem of determining the densest possible packing for a given number of circles or for a given size enclosing circle has not been solved, at least as far as is known to the writer. About all that is known is the following:

If $M(R)$ denotes the maximum number of circles that can be packed into an enclosing circle of radius $R$, $R>2$, then

$$\frac{\pi}{2\sqrt{3}}(R-1)^2 < M(R) < \frac{\pi}{2\sqrt{3}}R^2 \quad (4)$$

which leads to the approximation of $M(R)$ for large $R$:

$$0.907\,(R-1)^2 \quad (5)$$

Expression (5) approaches an equality as $R$ becomes large. Beyond $R = 100$, the error is about 2% or less. Note that above this value the core arrangement is quite unimportant. For values below 100, expression (5) is a quick, approximate solution.

Once an approximate solution is obtained, an exact figure can be gotten from equations (1), (2), and (3). If the problem is within the scope of Table 1, one need not consult any other source.

Suppose that 39 tubes are required. Running down the right-hand column of Table 1, it is seen that the next largest number of enclosed circles for Case I is 43, corresponding to a minimum value for $R$ of 7.928 (left-hand column). Continuing down, for Case II, 42 enclosed circles corresponds to 7.557 minimum $R$. For case III, 42 circles results in minimum $R$ equal to 7.429. The last figure is the smallest, hence, the most economical or dense arrangement. If the diameter of the tubes is 2 inches, and 1 inch of clearance is desired between tubes, then the radius of the enclosed circles is ½ of 3 or 1½ inches. Multiplying $R = 7.429$ by 1.5 ($r$ had been assumed to be unity) results in a minimum inside shell radius of 11.1435 inches.

LOUIS BLENDERMANN ON

# PIPING AND PLUMBING

## Plumbing Systems for Motels

NEW motel construction has increased tremendously during the past few years and from all indications will continue to grow into a major construction project. Moreover, motels have changed considerably in style and scope. Just a few years ago most of the motels were poorly constructed and completely lacking in style and appearance. These motel establishments usually consisted of a small single room attached to a series of other

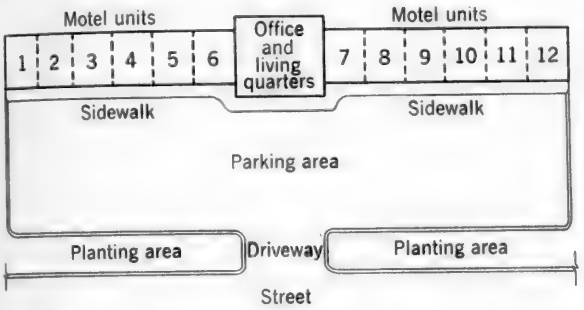



**Fig. 1. Typical arrangement of a motel showing location of motel units and utilization of ground area.**

rooms or were small individual buildings each containing a room or two.

New motels are extensive in design and size. Many refinements are provided including, attractive rooms and appointments, modern plumbing facilities, cafeterias, swimming pools, recreation rooms, tennis courts as well as all the other desired features to make the traveler feel at home. The current trend is to attach all the rooms as a unit. A motel establishment may consist of one or several units. Also, the motel may be a single story series of units or even a two-story series of units.

Previously, when an owner wanted to invest in a motel establishment he contracted with a builder to construct a motel of the size and number of units permitted by his budget. In a good number of cases the owner would attempt to build a few units himself as a start, and then add more when he could. This trend has changed, however, and the owner realizes that if he intends to attract the traveler, he must have something to offer. A result is that the owner now employs an architect to design his motel, and he has found it good policy to employ competent engineers to design the required heating, air conditioning, electrical, water and sanitary systems.

### Modern Motel

Many types of plumbing design might be considered for the modern motel establishment.

For purpose of discussion, we shall consider a motel of rather simple proportions, keeping in mind, that as the motel increases in size, the systems shown will also increase proportionately. The plan of the motel shown in Fig. 1, will serve as the basis for the various design points in this article.

The establishment for discussion consists of 12 motel units, Fig. 1, with a central building set in the middle of the units. In this instance the units are placed in a straight line. The parking area is in front of the building although it may be placed in the rear. The typical plumbing systems and facilities that may be required for this establishment are as follow:

Sanitary system, storm water system, cold water, service hot water, gas, fire protection, swimming pool, and lawn irrigation. This represents the broad scope of plumbing systems that are a part of some motels. We shall consider only the basic systems as are contained in most of the average motels.

These are: Sanitary, storm, cold water, and service hot water.

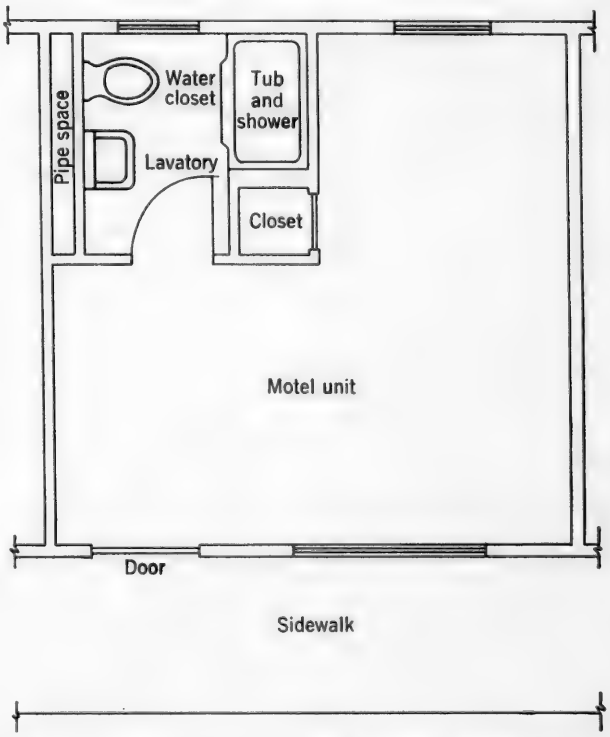



**Fig. 2. Arrangement of plumbing fixtures in toilet room of motel unit.**

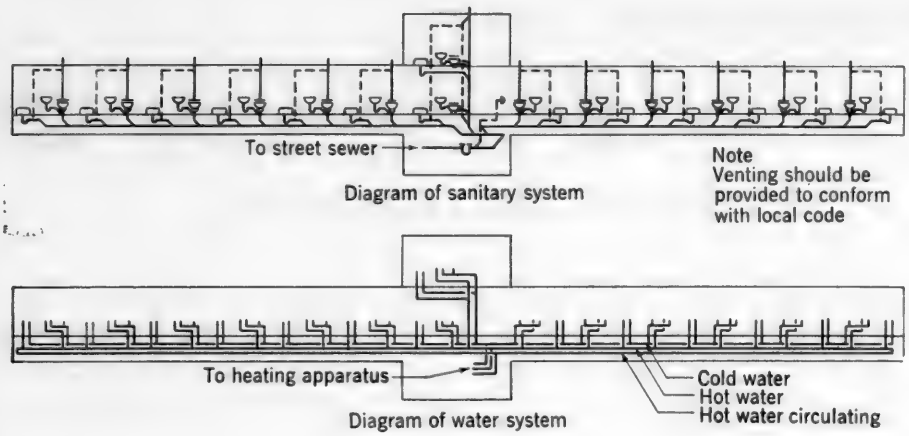



Fig. 3. Layout of sanitary and water systems for motel plan of Fig. 1.

### Typical Motel Unit

Figure 2 illustrates a typical motel unit and shows the layout of the toilet room in that unit.

The plumbing fixtures consist of a water closet, lavatory and a combination bathtub and shower. It is good practice to utilize high quality fixtures and trim since such facilities leave a very favorable impression on transients and greatly add to the motel's reputation. High quality mixing valves for the shower not only ensure an enjoyable shower but also prevent scalding. It is very important that this room be spacious enough to permit ease in movement.

The illustration shows the outline of the room without showing the placement of the furniture and equipment.

### Arrangement of Plumbing System

A diagrammatic arrangement of the plumbing system for the motel illustrated in Fig. 1, is given in Fig. 3.

Here are shown the roughing for the water closet, lavatory and combination tub and shower for each unit. The roughing connects with the horizontal sanitary line which conducts the waste to the basement of the administration building where it is trapped and vented before being discharged into the street sewer facilities. If street sewer facilities do not exist, the waste matter must be disposed of in a septic tank system.

The water service from the street main enters the basement of the administration building and is distributed in both directions to serve the motel units.

Hot water is generated in the basement of the administration building and is then distributed in both directions to serve the motel units.

Storm water is either discharged on the surface of the ground, or is conducted to the street storm water facilities, or can be disposed of in dry wells. In this instance, we shall assume that the storm water is discharged on the surface of the ground.

Since the sanitary, storm and water lines are installed underground, it might be practical to install them in a trench which would also contain the heating lines and electrical conduits. Often the water lines are run in the roof space over the motel units. The decision on where to place the facilities is determined on the particular nature of each project.

### Access Trench

When an access trench is utilized, it could be similar to that shown in Fig. 4. The trench need only be of sufficient proportions to contain the facilities and to allow a man to crawl through the space to perform any necessary maintenance or repair work. Other satisfactory types of underground arrangements, though not described, can also be used.

### Types of Plumbing Fixtures

There are many types of plumbing fixtures to meet the owner's budget. Moreover, colored fixtures are available to match any color scheme desired in the bathroom. There are three basic types of water closets available: The floor mounted water closet with a low-down tank combination; the floor type water closet utilizing a flush valve; a wall mounted water closet using a flush valve. Each type has its particular advantage. Figure 5 shows three different types of fixtures. The first type has an advantage in that, only small diameter water piping need be installed to supply the fixture. A disadvantage of the fixture is the space it occupies in the room as well as its cumbersome appearance.

The second type has the advantage of occupying very little room in the bathroom, and although it requires a larger diameter water supply to serve the flush valve, the flush valve represents the modern trend.

The third type fixture occupies the least space of all and enhances the appearance of the bathroom. If desired, the floor and wall type closets can be supplied with back spud outlets to permit concealment of the flush valves. Thus, only a push button will appear on the wall to activate the flush valve.

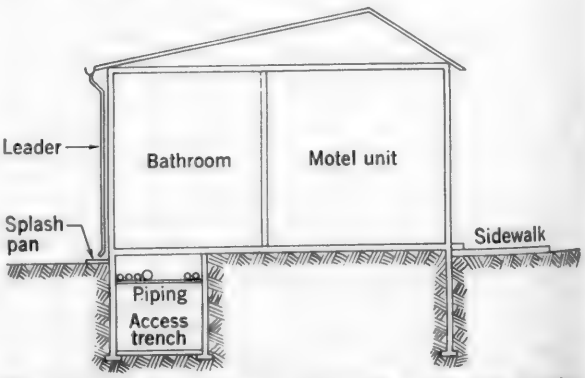



Fig. 4. Side elevation of a typical motel unit showing access trench.

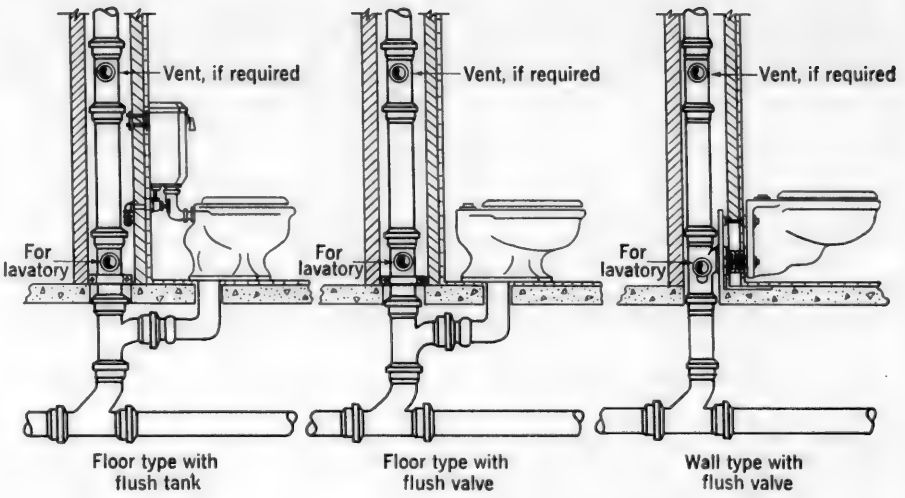



Fig. 5. Suggested arrangement of roughing for various types of water closets.

### Back to Back Fixtures

When fixtures are set back to back with a common pipe space between them (for example, if the water closets and lavatories for two motel units are placed back to back) a savings in roughing cost can be expected. However, these are issues that only the engineer can best determine. Since economy is a significant factor in motel construction, the owner will be assured of getting the most for his expenditure when he employs a reliable architect and engineers.

### Water Supply

When an adequate water supply is available, the task of supplying water in abundant quantities is an easy matter. If however, sufficient pressure is not always available during certain periods of the day or year, steps must be taken to ensure a constant supply and pressure.

Several methods can be utilized to increase water pressure. In most cases, however, it is only necessary to add a booster pump, and a typical installation is shown in Fig. 6.

In this figure the pump is placed in the water supply line and there is a water supply bypass around the pump. When the pressure in the line drops below a prescribed limit, the pump is activated to maintain the desired pressure until normal water pressure is resumed. This method of boosting water pressure is a reliable one and can be counted on for many years of trouble-free service.

### Pneumatic Water Supply

For motels of larger size, the booster pump may not be sufficient and a pneumatic tank can be considered. Water pressure is built up by the pumps and the tank, thus assuring a steady flow of water throughout the motel units. Figure 7 shows a typical arrangement of tank, piping, air compressor and component apparatus.

As illustrated, the water supply bypasses the pneumatic tank system but a branch from the water supply is connected to the pump suction. The discharge from the tank is reconnected back to the supply for the fixtures.

The pump or pumps force the water directly into the storage tank which is partially filled with a volume of air at a prescribed pressure maintained by the air compressor. The water in the tank occupies approximately

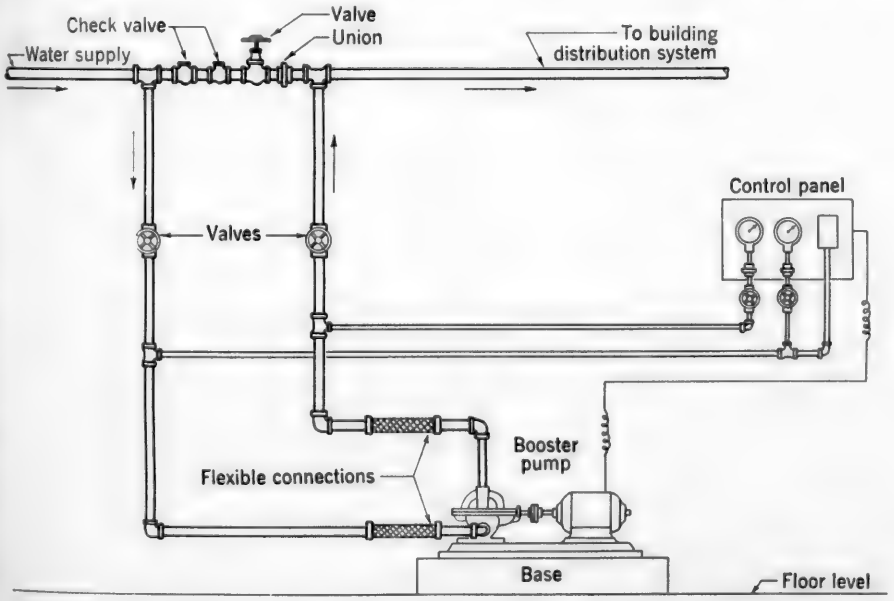



Fig. 6. Arrangement of booster pump supply system.

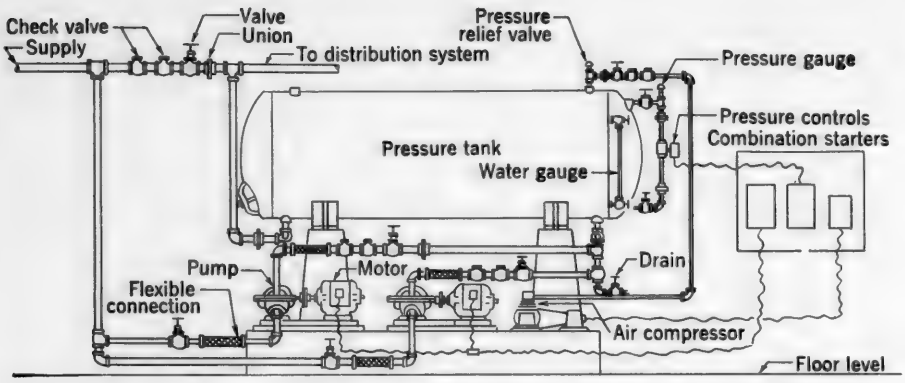



Fig. 7. Typical piping installation with a pneumatic tank system.

two-thirds the capacity of the tank. The water level in the tank is shown at the water glass. Since the water is pumped into the tank under pressure, it will further compress the air. This compressed air is the force that acts to furnish the water in the amount and pressure needed for the demand requirements of the motel.

The size of the pneumatic tank, pumps and related equipment is determined by the overall size and needs of the motel.

A pneumatic system has the advantage that it can be installed in the basement of the administration building and when properly designed and installed, it can be counted upon to service efficiently the needs of the motel units.

### Service Hot Water

Service hot water can be furnished by a number of different methods. The selection of the proper unit depends upon the number of fixtures served and the means of generation as well as the type of fuel available. Hot water in abundant quantities is required for motels where bathtubs and showers impose a heavy demand.

Let us assume that the motel units are heated by a hot water heating plant. A method similar to that shown in Fig. 8, may then be considered for space heating and to generate hot water. This figure shows the piping to and from the submerged coils in the space heating boiler. Cold water passes through the coils, is heated, and then moves on to the hot water tank where it is stored. The water then circulates between the storage tank and the coils until the desired water temperature is reached in the storage tank. A mixing valve is employed to ensure positive temperature for the water that passes to the fixtures. A circulating pump is placed on the hot water return line to assure a positive circulation of hot water.

Should numerous motel units be involved, then this method will not be adequate. It is then necessary to consider individual means of hot water generation. This would consist of a heater combined with a storage tank. Many manufactured units are available for this purpose and may be oil-fired, gas-fired or can be suited to the particular fuel at hand. An individual unit, of course, is a must in warm climates.

The dotted lines denote the piping arrangement used when this method of hot water generation is utilized.

Since motels are an ever increasing phase of construction progress, it is important that sufficient attention be given to the design of the plumbing systems required.

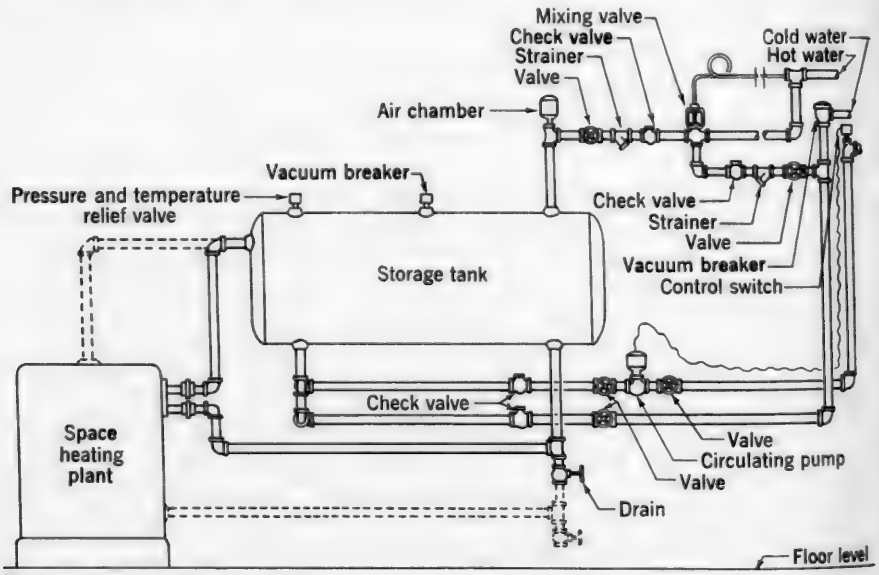



Fig. 8. Arrangement of space heater, storage tank, and piping for generation of hot water.

Note
Dotted lines show the piping hook-up if hot water is to be generated in a seperate heater and not connected to the space heating plant

# NEWS OF EQUIPMENT AND MATERIALS

**Use the convenient prepaid postcard appearing on the last page for securing further information on new equipment and materials described in this department.**

## Packaged Water Chiller

Heat-X, Inc., a subsidiary of Dunham-Bush, Inc., Brewster, N. Y., has introduced the ARPC, an air-cooled packaged water chiller designed primarily for residential air-conditioning applications.

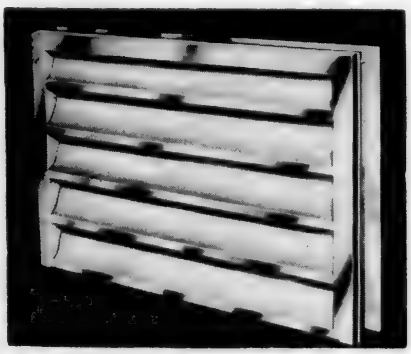
The unit is furnished complete with 2, 3, or 5-hp compressor, Inner-Fin air-cooled condenser and water chiller, superheater heat interchanger, and the necessary controls. Because of these features, its compactness, and the facility with which it can be installed, this product greatly simplifies the problem of providing homeowners and small commercial and industrial plants with maximum atmospheric comfort.

The cabinet is finished in an attractive, weather resistant blue aluminum paint which makes the unit suitable for installation either indoors or outdoors.

**More information? Circle Item 1, postcard, last page.**

## Aluminum Outside Louvers

A line of extruded aluminum outside louvers is announced by Titus Mfg. Corp., Waterloo, Iowa. Unique S-shaped blade allows greater free area, yet retains characteristics necessary for maximum weatherproof effectiveness, the company states.



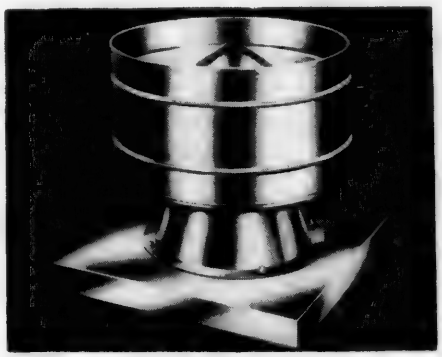
Louvers present a streamlined appearance and can be used in an exterior wall opening where a continuous flow of supply or exhaust air is desired. They are made of extruded aluminum sections, 12-gage in thickness. Longitudinal reinforcing beads are used for extra strength and rigidity.

Available furnished in any width, length, or finish desired, louvers may be equipped with bird and bug screens to fit on back or exterior face.

**More information? Circle Item 2, postcard, last page.**

## Ventilator Base Is Seamless

Development of a seamless spun base for small square to round transition bases is announced by Penn Ventilator Co., Philadelphia, Pa.



Construction is of spun aluminum, complementing modern architectural trends. One piece, weather tight, and properly tapered, this device provides a built-in condensation gutter. An easily removable top assembly gives access to curb-mounted air control accessories.

Bulletin PX-8 describes bases in detail.

**More information? Circle Item 3, postcard, last page.**

## 2-Wire Submersible Pumps

A complete line of 2-wire submersible pumps, ranging from ¼ through 1 hp, has been developed by Rapidayton Division of Tait Manufacturing Co., Dayton, Ohio. Capable of reaching depths to 360 ft in 4 inch (or larger) wells, these Dolphin submersibles meet the needs of any shallow or deep well installation.

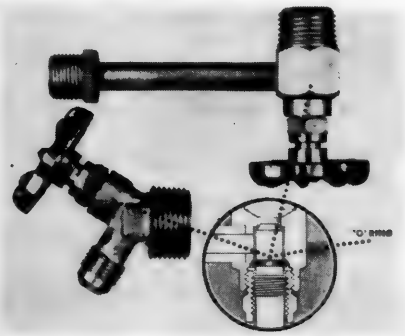
The pump is furnished with a cable attached, 60 to 100 ft long, depending upon the motor size. No control box is needed, and there are no water-tight splicing problems. Above the well the cable is connected to a simple motor overload protection box which is furnished.

They are available as pump-only models and as complete systems. A complete package includes pump with cable attached, overload protection box, fittings, and 42-gal pressure tank.

**More information? Circle Item 4, postcard, last page.**

## Fuel Oil Valves

Newly designed 20V Series shut-off valves made by Anderson Brass Co., Detroit, Mich., feature an O-ring seal which replaces older-style packing, positively eliminating the packing nut leakage problem.



The two valves illustrated are designed specifically for fuel oil. The angle design of the 25V type, at left, permits easy installation directly to oil tanks and drums eliminating sharp tubing bends. The 21V-NP valve, at top, with ½-inch inlet and ⅜-inch outlet, allows direct connection to the underside of a fuel oil tank and to the fuel oil filter. There is no need to backseat valves, or tighten the packing nut, to eliminate stem leakage in the open position.

**More information? Circle Item 5, postcard, last page.**

## Central Hydronic Systems

Centralized factory pre-engineered systems for cooling or cooling and heating are offered by Admiral Engineering Co., Inc., Chicago, Ill. Called Hydromation Systems, they provide 24-month operation under fully automatic continuous flow.

Centralization of apparatus and controls that can be built into these systems provide, for instance, cooling in some zones at the same time other zones are being supplied automatically with heating. Pre-determined time operation of zones and their temperatures is available.

Units are delivered with all pumps mounted, piped, and wired. Controls, as specified, are ready for full operation. Refrigeration cycle is complete and fully charged. System has been factory operated under varying load conditions and control system tested and operated completely.

Illustration shows blending cell station with zone circulating pumps and master panel, part of 100-ton installation in candy factory. Weath-O-Matic control varies heating water temperature in direct relation to rise or fall in outdoor ambient temperature.

**More information? Circle Item 6, postcard, last page.**

## Direct-Driven Propeller Fans

Type LS direct-driven fans, offering better performance in low static pressure ranges, are offered by Aerovent Fan Co., Inc., Piqua, Ohio.

Employing newly-developed, 4-blade Macheta airfoil propellers, these units are available in ring, square panel and duct types, in sizes from 24 to 48-inch diameter. Ring and panel types are designed with curved orifice rings, to provide a uniform flow of air to the propeller blades. Panel type is easily installed in any square opening with four corner-bolts. Duct type is used in standard-application duct sections, with entire unit inside of air stream.

These heavy-duty all-welded units are available, on order, with special-duty motors, alloy propellers, and protective coatings for unusual or extreme moisture, temperature, or corrosive conditions.

**More information? Circle Item 7, postcard, last page.**

## Hermetic Compressor Opener

A device that automatically opens any shape hermetic compressor up to 20 inches in diameter—regardless of position of the weld is announced by Frankell Mfg. Co., Inc., New York, N. Y.

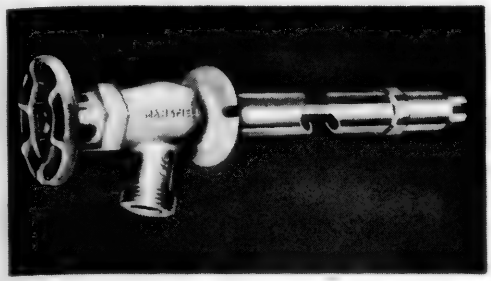
Unit will open a faulty hermetic compressor in just two minutes of the operator's working time, company states. It is constructed of heavy gage metal and has two shatterproof windows for full observation, GE motors completely enclosed with grease packed ball bearings, and full length door hinges.

Opener requires little maintenance, is 40 x 24 x 40 inches, takes 11 amps full load on 115 volts, weighs approximately 275 lb, and is fully guaranteed.

**More information? Circle Item 8, postcard, last page.**

## Non-Freeze Wall Hydrants

Wall hydrants said to eliminate all possibility of freezing during the winter season are announced by Mansfield Sanitary, Inc., Perrysville, Ohio. Known as No. 375 and No. 376 frost-proof wall hydrants, they control the water supply through a valve seat located within the warm home or building, at the end of an extra long stem. Besides preventing possibility of freezing, they eliminate need for inside cut-off valves. They also do away with



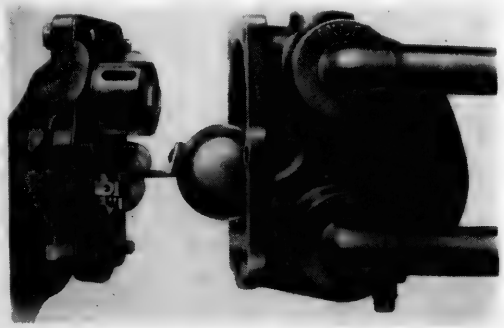
necessity for seasonal inside *turn-off* or *on* of sillcocks.

Adaptable for placement in either new or old homes and buildings, hydrants are of copper and brass construction. Model 375 is supplied with an adapter end suitable for ½-inch female sweat or ½-inch IPS male thread connection. No. 376 has a ¾-inch IPS thread outside and a ½-inch IPS inside. A centering spot on the bottom of the adapter permits accurate positioning of spout from within the home. Installation is further simplified by a large notched flange at rear of sillcock body.

**More information? Circle Item 9, postcard, last page.**

## Trap Construction Simplified

Simplified construction increases the accessibility of float-thermostatic steam trap, Type FT, manufactured by Sarco Co., Inc., New York, N. Y., greatly facilitating inspection, maintenance, and installation. Entire operating element is one unit, which can be removed without disturbing inlet and outlet connection to the semi-steel trap body, suitable for 125-psi steam. Operating elements consist of stainless steel valve mechanism, copper float, and bronze thermostatic air vent.



Valve is designed to provide condensate seal and prevent loss of steam. It discharges condensate at steam temperature continuously and without shock. Separate air vent, requiring no adjustment when pressure changes, removes all air and incondensable gases, allowing no steam to escape. Each trap is factory-tested under steam pressure and condensate load conditions to guarantee the proper operation of the float-valve and thermostatic by-pass element.

Units are recommended to drip steam mains, unit heaters, blast coils, heat exchangers, and other process applications requiring accurate temperature control.

**More information? Circle Item 10, postcard, last page.**

## Thermostatic 3-Way Valve

A thermostatic 3-way valve is added to the line of thermostatic control valves, produced by Lawler Automatic Controls, Inc., Mount Vernon, N. Y.

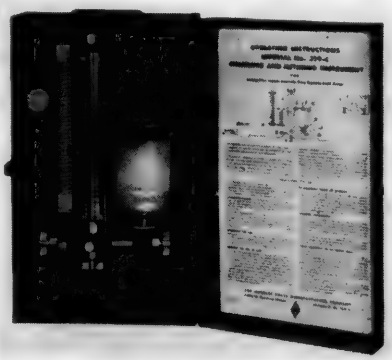
The new valve is not affected by high pressure differentials in operation. It features a pressure balanced type of seat construction which provides positive closing of both seats regardless of high water pressures acting against them.

The valve is a piston type and automatically regulates water flowing through it, thermostatically. On increase in temperature, the piston opens the cold water port allowing more cold water to enter, while at the same time closing the hot water port to bring the delivered water down to the desired temperature. It is presently available in 2-inch sizes and larger, with smaller sizes becoming available in the near future.

**More information? Circle Item 11, postcard, last page.**

## Refrigerant Charging Instrument

A refrigerant charging and metering instrument that provides an efficient method for servicing capillary controlled hermetically sealed refrigeration systems is introduced by The Imperial Brass Mfg. Co., Chicago, Ill. Use of the unit makes possible accurate measuring of small quantities of dry refrigerant, and exact charging of refrigerant is assured.



Used in combination with a service manifold and vacuum pump, refrigeration systems can be discharged, purged, evacuated, and recharged from standard cans of refrigerant. The instrument is calibrated for both refrigerant 12 and 22, and complete operating instructions are mounted on the kit.

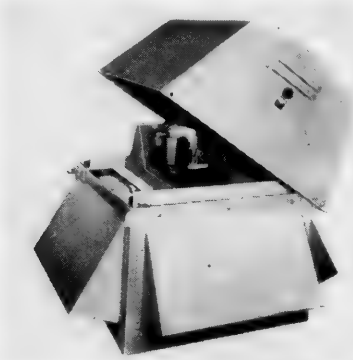
Packaged and protected by a steel case, the unit is designed for operation without removal of the case. Weight of kit is 8 lb.

**More information? Circle Item 12, postcard, last page.**

## Direct Drive Centrifugal Ventilator

A direct drive centrifugal roof ventilator is being marketed by The Peerless Electric Co., Warren, Ohio. Wheel diameters of the ventilators range from 12¼ to 36½ inches. Capacities are from 1100 to 25,000 cfm. Motor sizes range from 1/10 to 10 hp.

The backward curve wheels are dynamically balanced, and are taper-locked to the shaft. The true spun venturi inlet assures quietness and high efficiency and helps the unit operate with near to centrifugal blower characteristics.

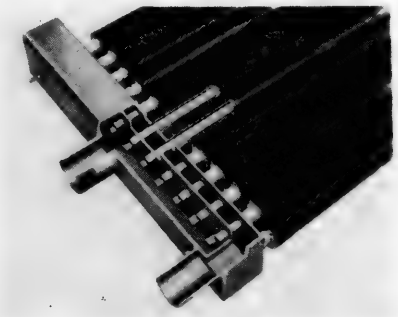


Knockouts are provided in the frame and curb structure for internal wiring. The unit has a sturdy, welded base with ample curb overlap, and is designed for standard roof curbs. A bird screen is standard equipment; the unit has been tested and rated with this bird screen in place.

More information? Circle Item 13, postcard, last page.

## Double-Tube Steam Coils

A double-tube steam distributing coil unit, having supply and return connections at the same casing end, is available from American Blower Division of American-Standard, Detroit, Mich. The new unit, designated Type D1, is an expansion of the company's line, providing a heating coil of freeze resistant design suitable for use in a broad range of installations.



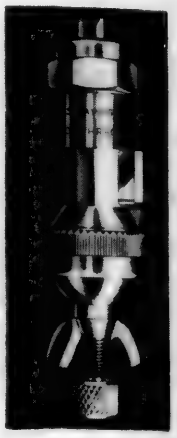
By means of a compartmented header, steam is supplied to the inner tubes and is forced through orifices into the surrounding outer tubes. The coil is available with one or two tube rows deep in a single section for a wide variety of casing sizes.

Effective freeze resistance and good temperature distribution depend on complete and rapid removal of condensate from the tube. Use of outer tubes of 1-inch OD and inner tubes of ⅝-inch dia provides optimum space between tubes for unrestricted condensate flow. In addition, inner tube spacer design is used for positive centering of inner tube, giving assurance that condensate will drain rapidly and completely. Further assurance of efficient drainage and maximum performance is achieved by pitching the tubes toward the header within the casing.

More information? Circle Item 14, postcard, last page.

## Diaphragm Spray Nozzles

A spray nozzle equipped with manually operated shut-off assembly is announced by Spraying Systems Co., Bellwood, Ill.



Designed primarily for manifold installations, where selected nozzles must be independently shut-off to meet varying spraying requirements, construction includes a diaphragm valve, shut-off screw and wing nut. To close the nozzle, the shut-off screw is turned down to hold the diaphragm in shut-off position. Wing nut firmly holds the shut-off screw in place. When the shut-off screw is set in *open* position, the diaphragm valve functions to shut-off the nozzle as soon as the manifold line is closed, eliminating any dripping that might occur as line pressure is reduced.

Nozzles are made in brass with internal monel metal strainer. A wide choice of interchangeable orifice tips are available covering a considerable capacity range as well as selection of full cone, hollow cone and flat spray patterns. Data Sheet 6033 is available.

More information? Circle Item 15, postcard, last page.

## Indoor, Outdoor Time Switches

Two time switches are announced by Instrument Dept., General Electric Co., Schenectady, N. Y. Available in both indoor and outdoor design, they have 24-hr dials which can be used for as many as 12 *on-off* operations per day, with trippers set as close as 1 hr apart.

Indoor model TSA-47 is specifically designed for flexibility, with both double and single pole contacts available. It is capable of withstanding 350 amps of inrush current. Regular-duty indoor applications for which it is suited include use for floodlighting, heating, air conditioning, refrigeration, and motor starting.

Outdoor model TSA-41 is for use where a heavy-duty outdoor case is required, including applications which involve all types of outdoor lighting, capacitor switches, heating, irrigation and pump control. Department engineers say that to their knowledge it is industry's only regular-duty time switch with a truly rain-tight case at no extra cost.

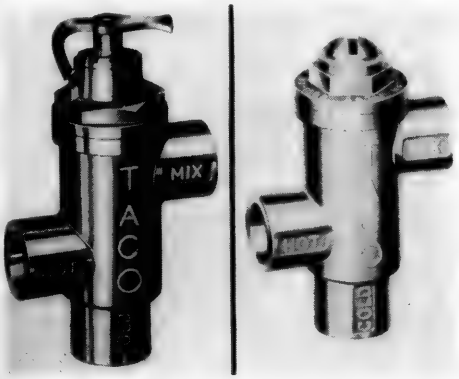
More information? Circle Item 16, postcard, last page.

## Sweat-Joint Tempering Valves

Two tempering valves with ½-inch sweat connections are introduced by Taco Heaters, Inc., Cranston, R. I. Both have an adjustment range from 120 to 160 deg F.

No. 508 has a convenient external handle for adjusting.

No. 507 has a concealed adjustment which requires the use of a screwdriver to change.



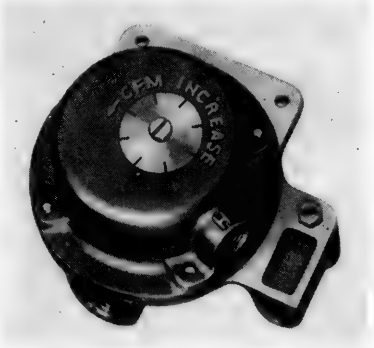

Both valves have forged bronze body and cap and hermetically sealed thermal element. They introduce cold water only when hot water source is above setting. Thermal is element easily replaced without disturbing any piping connections.

**More information? Circle Item 17, postcard, last page.**

## Mixing Unit Volume Controller

A constant volume controller for mixing units used on high velocity, high pressure, double duct air conditioning systems has been developed by Johnson Service Co., Milwaukee, Wis. According to company engineers, the simple, inexpensive device is designed for installation in the mixing units of leading manufacturers.

Called the R-316 air flow controller, it provides constant volume air distribution through every unit of a system, maintaining a constant flow pattern within each



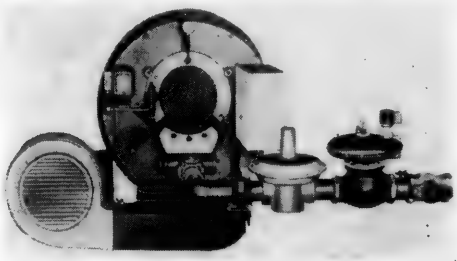

conditioned space. This is accomplished, engineers say, regardless of the number of mixing units, the length of duct runs, or the differences in pressure between the hot and cold ducts.

The accurate control is a differential pressure regulator which varies its pneumatic output in accordance with a pressure difference measured in the mixing unit. This pressure difference can be measured at any point which is representative of the flow through the unit. As the power source for this device is taken from the filtered and dehumidified control air supply system, problems arising from residual dirt in the duct distribution system and dirt contaminated duct air are eliminated. By using control system air power, the static pressure of the supply system can be maintained at the minimum pressure required for air distribution without the necessity of maintaining a higher pressure for instrument operation.

**More information? Circle Item 18, postcard, last page.**

## Forced Draft Gas Burner

General availability of a new industrial forced draft, flange mounted gas burner, lower in cost than conventional forced draft burners and easier to install, has been announced by Iron Fireman Mfg. Co., Cleveland, Ohio. It is for use with Scotch Marine or other types of high



or low pressure boilers and can be attached by bolting the burner assembly to the boiler front.

To be known as Series RGF-F, the burner is designed to fire all types of fuel gas with high combustion efficiency and a wide turn down ratio.

All essential elements of the burner mechanism, including controls and forced draft air supply, are factory assembled and tested to reduce problems of field applications to an absolute minimum. An enclosed electronic control panel is mounted on the unit.

**More information? Circle Item 19, postcard, last page.**

## Airfoil-Blade Centrifugal Fans

A series of all purpose centrifugal fans with airfoil blading is announced by Westinghouse Electric Corp., Pittsburgh, Pa.

The complete line (Series 8000) will bring airfoil-blade centrifugal fans in an effective range of applications including building ventilation, general air supply and exhaust, conventional and high-pressure air conditioning, industrial processing, tunnel and combustion air supply.

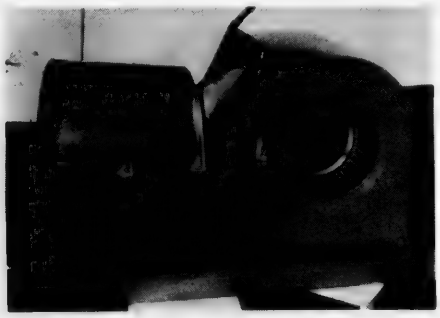
Most fan noise is caused by turbulent flow of air set up by conventional flat blades. Airfoil blading on the new fan line creates streamlined air flow pattern and makes possible perceptibly quieter operation. Power requirements are also much lower with the airfoil blade design thereby reducing operating costs.

The series is available in standard AMCA sizes, and will handle up to 700,000 cfm at pressures to 16¾ inches.

**More information? Circle Item 20, postcard, last page.**

## Large-Capacity Humidifier

A large-capacity humidifying unit capable of humidifying an area of 53,000 sq ft is announced by Swan Humidifier Co., Inc., Ballston Spa, N. Y. Called Model 10 of Series E, it is rated at 35 gal per day at 72 deg F and 10% relative humidity.

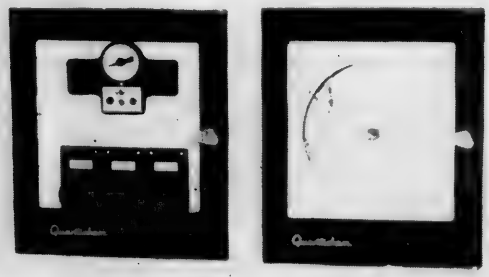


Recommended for such applications as textile plants, print shops, schools, libraries, and churches, its heart is the Golden evaporating drum, consisting of 2 sheets of vinyl plastic which revolve in water. Humidifying surface is proportional to rpm. Residential models based on this principle have been marketed successfully by this company for some time.

More information? Circle Item 21, postcard, last page.

## Automatic Concentration Analyzer

Milton Roy Co., Philadelphia, Pa., announces the availability for industrial installation of their Quantichem automatic analyzers. Backed by more than three years of research and field studies, the new instruments will continuously analyze water for total hardness or silica concentration. Each analysis is on a fixed time cycle with the results recorded on a separate unit that may include alarms or control devices.



The analyses are based on the effects silica or hardness-causing calcium and magnesium ions have on specific reagents which change the amount of light that a given volume of sample solution will absorb or transmit. The difference in the amount of transmitted light through a zero cell and a test cell is measured photoelectrically, and because the difference is proportional to the concentration of silica or hardness, the instruments are calibrated to read in units of concentration.

The recorder, at right in photo, is equipped with adjustable *high-low* limit switches that can be set at any value within the instrument range. The analyzer, on left, is automatically calibrated in each cycle, and pilot lamps flash when the cells must be cleaned or the light source must be replaced. Water to be tested must be available at pressures above 10 psi and temperatures below 100 deg F.

More information? Circle Item 22, postcard, last page.

## Adjustable 4-Cone Diffuser

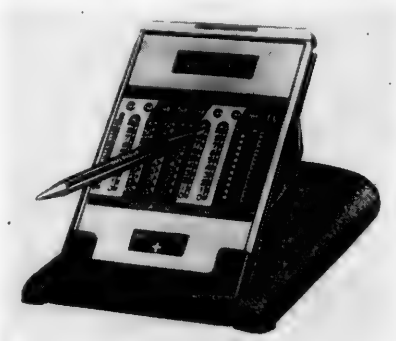
Universal Diffuser Corp., Tuckahoe, N. Y., announces production on Series QP 4-cone adjustable diffuser. Removable core is attached to a sturdy, hollow brass screw connected to the installation spider. By rotating the lower blade, the core can be raised or lowered to change the air flow from a horizontal pattern through any angle to vertically down. Core is instantly removable by holding one of the larger cones and turning it to the left.

Diffuser, made in a complete range of sizes from 6 to 36 inches, can be supplied with a multi-blade damper directly attached to the core. This eliminates additional installation labor. The standard Flexiflo accessories, equalizing deflectors, and splitter dampers, will work perfectly with this diffuser.

More information? Circle Item 23, postcard, last page.

## Pocket-Sized Adding Machine

Designed for anyone who figures in dollars, cents, and decimal amounts as well as in feet, inches, and fractions of an inch, a pocket-sized adding machine, called Fractomator, is made in West Germany and available from Alexander Drafting Equipment Co., Pasadena, Calif.



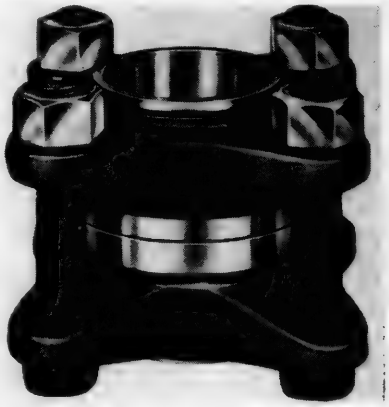
The computer totals up to 100,000 when used as an adding-subtracting machine. The use of the decimal columns, in conjunction with two extra columns, one divided in inches, the other in fractions of an inch as low as sixteenths, allows effortless addition and subtraction of dimensions expressed in feet, inches, and fractions.

The machines, guaranteed for 36 months against defects, come in a variety of stands allowing many different uses. Pocket models in leather notebook cases can be used in the office as well as on the job. Desk models are provided with cast iron stands, heavy enough to allow machines to be operated with one hand.

More information? Circle Item 24, postcard, last page.

## Forged Steel Welding Flanges

Availability of all sizes of its Wolf-Linde socket type welding flanges is announced by the manufacturer, Dersch, Gesswein, & Neuert, Inc., Chicago, Ill. Self-

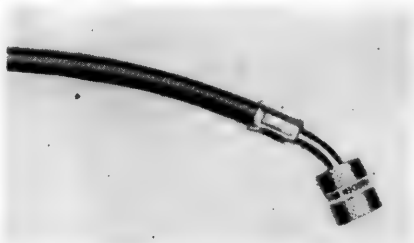


aligning deep socket permits quick and easy installation without costly precision cutting and beveling of pipe. Flanges are offered in sizes ¼ to 12 inches inclusive. They are compact, shock resistant, and of high strength, with tongue and groove construction.

**More information? Circle Item 25, postcard, last page.**

## Color Coded Charging Lines

Madden Brass Products Co., Aurora, Ill., has announced full production of their new color coded charging lines. Lines are in three colors: red for high side, white for charge, and blue for low side.



Color coding makes servicing easier, and simplifies work in close quarters. Line tracing is completely eliminated with color coded charging lines, as it is always certain just where the hose is hooked up.

Charging lines contain the company's regular quality features, including flexibility, all brass barb and ferrule for positive seal, tubular gasket that will not pop out, and finger-grip knurled nut for easier handling.

**More information? Circle Item 26, postcard, last page.**

## Redesigned Baseboard Line

A completely redesigned line of hot water and steam system Wall-Fin extended radiation units was announced by The Trane Company, La Crosse, Wis.

Featured are new element cradles and streamlined enclosures. The element cradle rides freely and quietly on sound-eliminating ball bearings, permitting horizontal element expansion without annoying metallic scraping noises. A versatile wall-mounting cabinet bracket is basic to the cradle assembly. The bracket is designed to support three cabinet heights.

Element enclosure cabinets have contemporary appearance, yet are rugged and durable. There are three styles to choose from with lengths of one to six feet in six-inch increments. Each is available in a 4 or 5¼-inch depth model and three standard enclosure heights.

**More information? Circle Item 27, postcard, last page.**

## Pump Will Not Lose Prime

Vertical (immersion type) circulating pumps are designed by The Deming Co., Salem, Ohio, for use in air conditioning, cooling and heating circulation systems, brine pumping, and for circulation systems in commercial laundry equipment, industrial parts washers, and other process equipment.

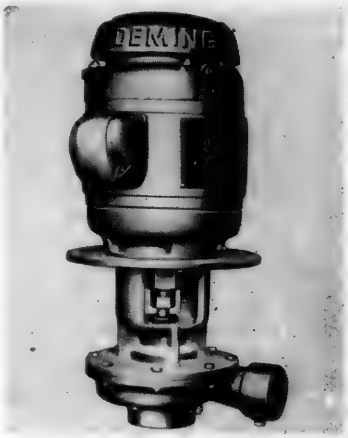



Fig. No. 4310 pump is a short setting model with the liquid end of the pump immersed in the pumped liquid. This keeps it primed at all times. It is leakproof and requires no liquid seal or stuffing box. It circulates up to 500 gpm against heads up to 100 ft. The pump is available in 1-, 1½-, 2- and 3-inch sizes for 1750 or 3500 rpm. Construction includes a graphite-impregnated steady bearing, stainless steel pump shaft, and optional bronze impeller. Bulletin No. 4310 describes performance and construction details.

**More information? Circle Item 28, postcard, last page.**

## Condensing Unit Line Expanded

Lehigh Mfg. Co., Lancaster, Pa., has expanded its line of Blu-Cold hermetic condensing units to include models in the ¾ to 2-hp range. Ten units have been added to its line, which now comprises 20 models ranging from 1/5 to 2-hp. The lightweight, reciprocating units are offered in air cooled and water cooled models for high, medium and low temperature applications and are designed for use with refrigerants 12 and 22.

Also expanded is its line of hermetic motor compressors, adding a group in the ¾ to 2-hp range, for a total of 22 models from 1/5 to 2 hp. Condensing units and compressors are designed for both original equipment application and replacement. They are interchangeable with several standard makes. The company is a supplier of compressors to automobile manufacturers and independent manufacturers of complete automotive air conditioning systems.

**More information? Circle Item 29, postcard, last page.**

## Heavy-Duty Impact Wrench

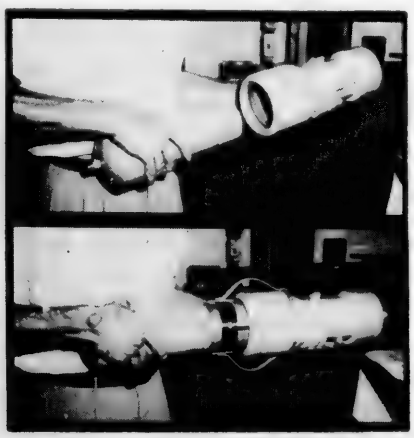
Impact wrench No. 300, with torque range of 300-450 ft-lb, augments its No. 100 impact wrench introduced last year, as a higher capacity tool of equal quality for heavy-duty construction, maintenance, and repair work, announces The Black & Decker Mfg. Co., Towson, Md.

With die-cast aluminum housing, lubricant-sealed ball bearings, and heat-treated gears, wrench is powered by a special-built motor for use on both a-c and d-c current, 115 or 220 volts. The tool is well suited for large, heavy nut running of ⅞ inch dia and up, as well as for cap and lag screw driving and removal. A specially-designed centrifugal fan and ventilating system give this tool the coolest possible operating temperature at all times, the company states.

**More information? Circle Item 30, postcard, last page.**

## PVC Quick Coupling Developed

A quick coupling that can be assembled and disassembled in seconds has been developed from high impact Koroseal polyvinyl chloride pipe produced by the plastic division of B. F. Goodrich Industrial Products Co., Marietta, Ohio. The coupling, which will take up to 10-deg misalignment in pipe joints, is recommended for temporary chemical, oil, water or disposal lines, according to the company.



The quick coupling pipe is so easy to assemble and disassemble that the operations can be performed in seconds. At top in photo, the joint is ready to assemble by merely pushing the grooved end of the pipe into the coupling until the thrust ring seats in the groove. To disassemble, at bottom in photo, snap collar of disassembly tool on pipe and push tool between pipe and coupling as far as it will go. Set yoke of tool over back of coupling, and pull pipe out of coupling, twisting slightly.

Quick coupling rigid pipe is available in 2, 3, and 4-inch sizes in standard 20 and 30-ft lengths. Pipe withstands high pressures and resists corrosion.

**More information? Circle Item 31, postcard, last page.**

## Gas Burner Safety Switch

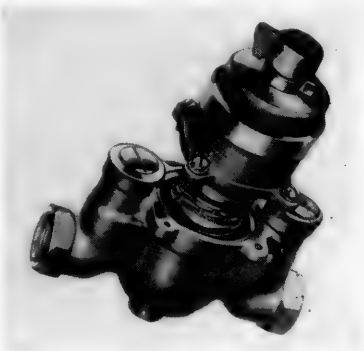
A positive action safety switch for the company's power gas burner, announced by Hastings Air Control, Inc., Omaha, Neb., insures the delivery of both primary and secondary air before opening the automatic gas valve. The Positrol switch eliminates the unsafe condition of the commonly used centrifugal switch or valve, the company states, which admits gas to the burner even if the air shutter is accidentally closed.

The power burner is designed to replace oil burners and is suited for down-draft furnaces and boilers. Even in coil-type heating plants, asserts the manufacturer, the power burner will save an average of 10% in fuel bills because its gas-air mixture remains constant regardless of stack temperatures or draft conditions.

**More information? Circle Item 32, postcard, last page.**

## Thermostatic Mixing Valve

A thermostatic mixing valve for water, called Temptrol, is the only thermostatic water-tempering unit that features a quickly replaceable cartridge which contains all working parts. A screwdriver is the only tool needed to remove the four screws required to replace the cartridge if service is necessary.

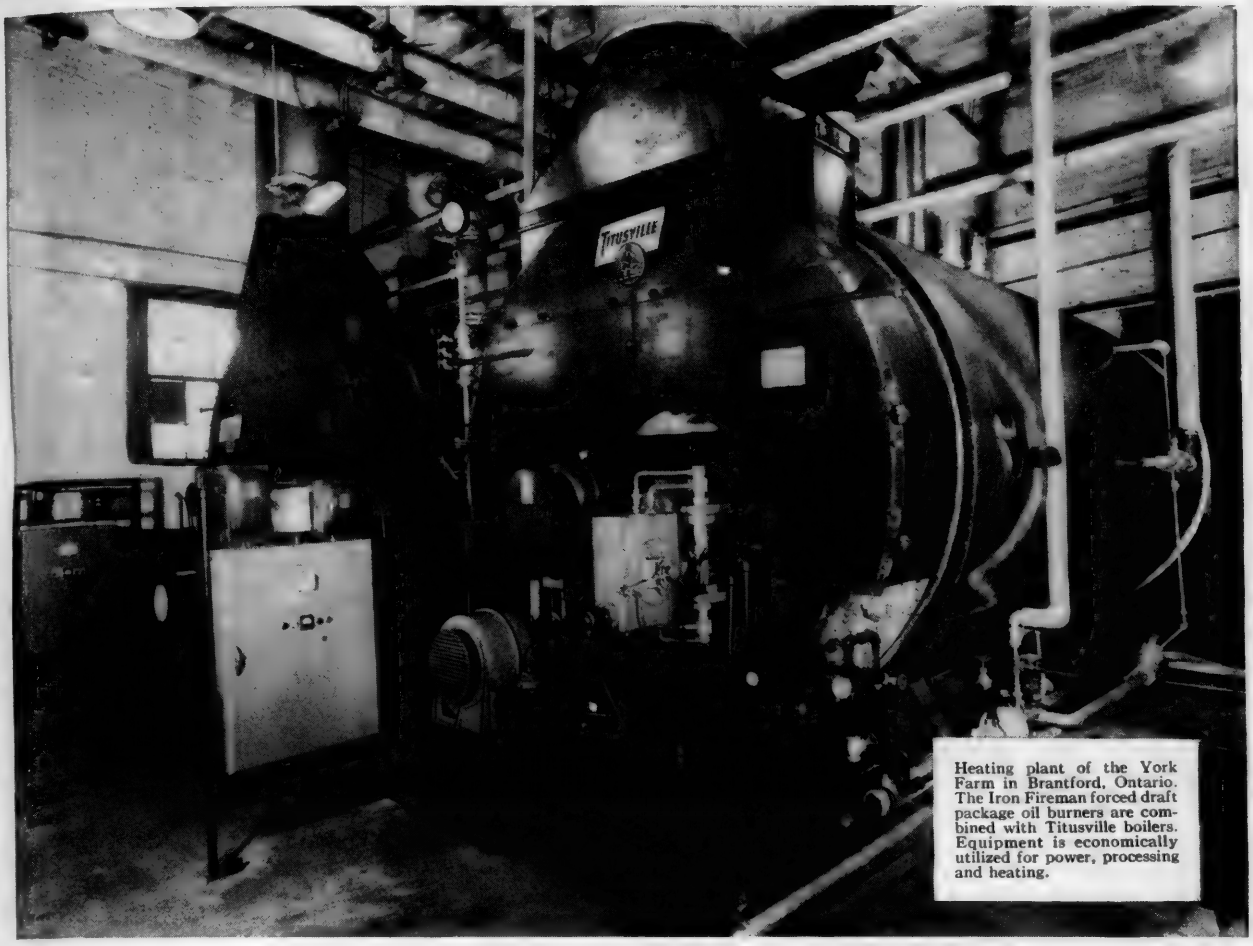


Recently developed by Symmons Engineering Co., Boston, Mass., the valve continuously and accurately maintains hot water temperature at all times. Temperature range adjustment is provided from 90 deg F all the way up to 180 deg, for dishwashing. The unit instantly and automatically compensates for changes in supply line temperature and pressure. In fact, it shuts down safely if hot or cold water fails.

The valve, which may be installed at the heater as a master control, or anywhere along the line as a zone control, is available in ¾, 1, 1¼, and 1½-inch sizes.

**More information? Circle Item 33, postcard, last page.**

*(Continued on page 122)*




Heating plant of the York Farm in Brantford, Ontario. The Iron Fireman forced draft package oil burners are combined with Titusville boilers. Equipment is economically utilized for power, processing and heating.

# These Iron Fireman Package Firing Units Saved the Owner $10,478 in One Year

York Farms in Brantford, Ontario reports that in 1954 fuel costs were $35,650.00. In 1955, after installation of the Iron Fireman forced draft oil burners with matched boilers, the fuel cost was reduced to $25,171.45 . . . a saving of $10,478.55!

**Iron Fireman firing system is engineered as a single complete unit.** The Iron Fireman "package" burner is a complete combustion system including burner, control panel, forced draft air supply and fuel system, all of which are correctly balanced, integrated, wired and tested at the factory. With Iron Fireman there is no divided responsibility—no locally assembled job with separate estimates and contracts. Rather it means a factory engineered unit which assures dependable performance, high operating efficiency and low fuel cost.

**Fits all types of boilers.** Firing units can be applied to any type of boiler with great advantages in installation costs and operating efficiency. Installation requires little more than bolting the entire unit to the boiler front and making service connections for power and fuel.

**For gas or oil, or gas-oil combination.** Takes any type of high or low pressure gas, or any grade of oil from No. 2 to No. 6. Oil-gas models can be switched from one fuel to another at a moment's notice without loss of firing efficiency. For full information, please mail the coupon below.

**IRON FIREMAN.**

AUTOMATIC FIRING EQUIPMENT
FOR OIL • GAS • COAL

IRON FIREMAN MANUFACTURING COMPANY
3356 West 106th Street, Cleveland 11, Ohio
In Canada: Write 80 Ward Street, Toronto, Ontario
Please send complete technical description and specifications.

Name_____
Company_____
Address_____
City_____ Zone____ State_____

*(Continued from page 120)*

## Fill Pipe Extension

Designated No. 1002, this fill pipe extension is newest addition to the extensive line of valves, fittings, and specialties available from Universal Valve Co., Elizabeth, N. J.

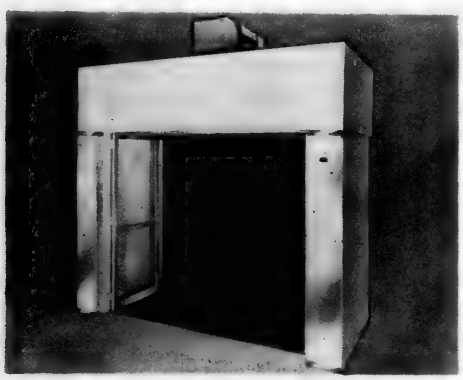
Low spots in pavement, when existing pavement is being black-topped, are a typical circumstance in which this fill pipe extension provides a simple and convenient solution for raising pipes so that the fill box may once again be flush.

Installation is accomplished simply by removing the existing fill box, screwing extension to pipe, and installing a new fill box. Thus a raising of approximately one inch inch is attained. To raise pipe higher than one inch, several extensions can be used. The extension is available in 2, 3, and 4-inch sizes.

**More information? Circle Item 34, postcard, last page.**

## Prefabricated Doorless Entrance

A prefabricated, package Air Curtain entrance for stores, shops and buildings is developed by American Air Curtain Corp., St. Louis, Mo. It does away with conventional doors and allows the entrance to remain open during business hours, keeps heat inside in winter, air



conditioned coolness inside in summer, and acts as an insulating barrier against wind, dust, dirt, rain, sleet, snow, and fumes.

The package unit is the outgrowth of past experience with package and custom installations which have been used by U. S. business firms since 1955, the company states.

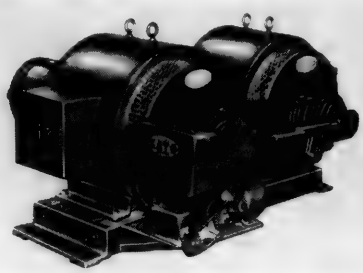
Entrances are 6, 8, 10, and 12 ft wide, all 8 ft high. The unit, which may be placed in new or existing buildings, comes with an attractive decorative aluminum finish, or a porcelain enamel finish, if desired. It is completely equipped with an electric control panel, blowers, motor, directional variable velocity discharge air nozzles, filters, and access doors for servicing. It can be equipped for steam, hot water, or gas heat, and may be had with either folding doors or sliding panels for night closing.

A 10-12 ft wide entrance, completely installed, will cost from $8,000 to $10,000, depending on the type of heating equipment used and the type of night closing doors desired.

**More information? Circle Item 35, postcard, last page.**

## Variable Cycle Motor-Generator

Convenient push button frequency adjustment at any location can be provided by this 1200 rpm synchronous motor and 1200 rpm, 5 kw, 3 phase revolving field generator set available from Kato Engineering Co., Mankato, Minn.



A motor with reduction gear provides power to alter pitch of variable pulleys on both motor and generator. Increase and decrease of speed is accomplished by merely pushing a *fast* or *slow* push button.

Precise frequency and voltage regulation is provided. Control equipment includes magnetic amplifier type voltage regulator, synchronous motor starter, load limit switch, and reset buttons. Remote control panels can be furnished, enabling remote locations of outlets with frequency adjustment to be installed.

**More information? Circle Item 36, postcard, last page.**

## Gas-Fired Boiler Added

A gas-fired boiler has been added to the line of 20-year guaranteed hydronic heating units of Crane Co., Chicago, Ill. The new Sunnyday 26 is available in eight sizes, for use with either hot water or steam heating systems.

The model is a compact boiler with an attractive gray and white, enameled-steel extended jacket. It features cast iron sections with integral secondary heating surface which provides staggered heat travel, tc recover a maximum of liberated heat.

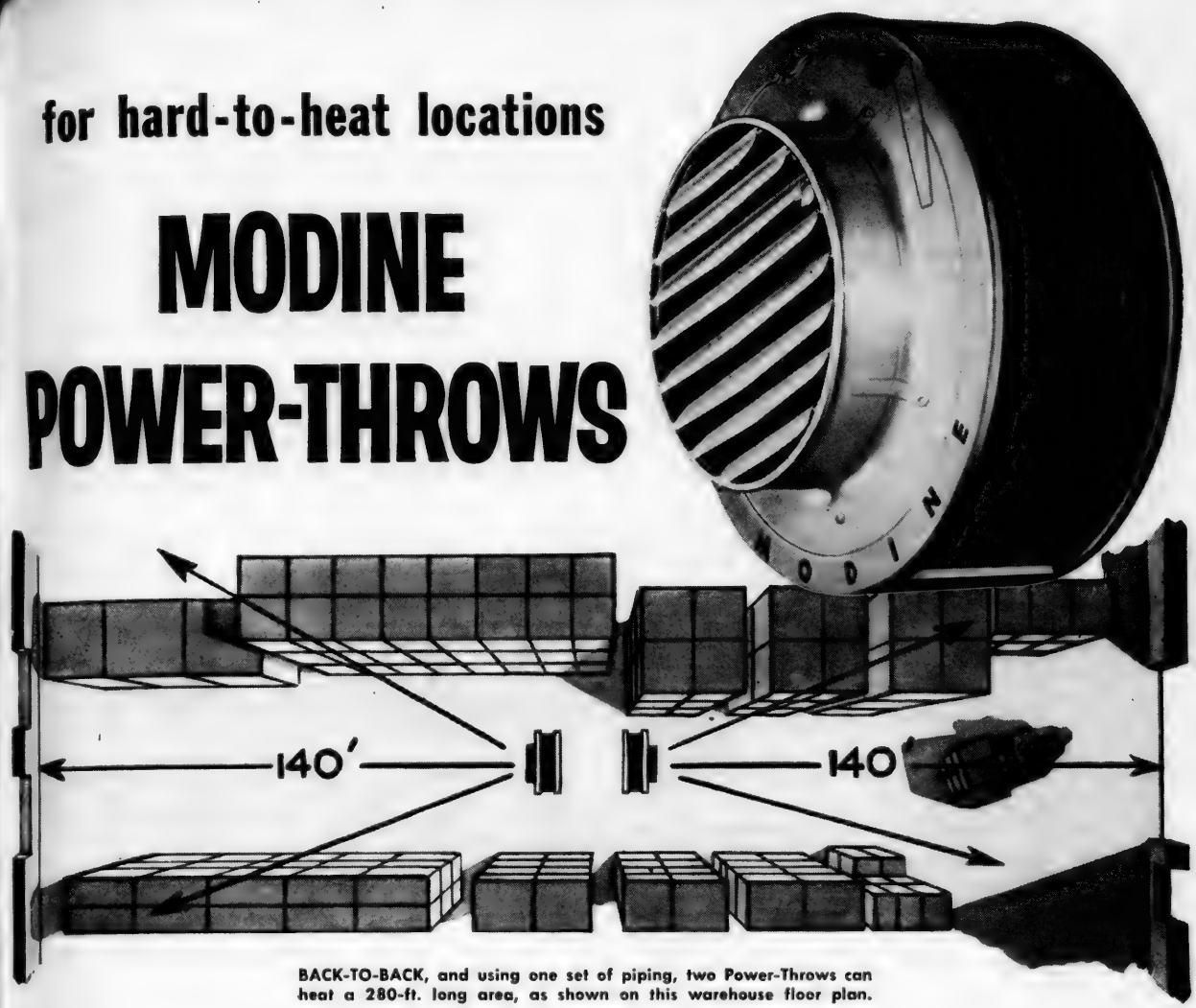
Gas burners are of the ribbon type, with a cast iron body and stainless steel ribbons for long life. Hot water models are available with a built-in tankless water heater, for supplying low-cost hot water.

**More information? Circle Item 37, postcard, last page.**

*(Continued on page 124)*

## for hard-to-heat locations

# MODINE POWER-THROWS




**BACK-TO-BACK, and using one set of piping, two Power-Throws can heat a 280-ft. long area, as shown on this warehouse floor plan.**

## . . . twice the range of conventional unit heaters

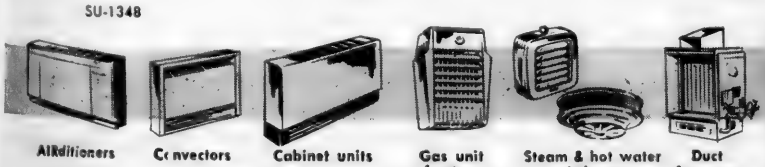
If you have a difficult heating problem, the Modine Power-Throw unit heater may be your answer. It is designed to provide a powerful horizontal discharge of heated air at higher than normal velocities. Its exceptionally long heat-throw—up to 140 feet—permits heat distribution over a wide area.

Power-Throws are used in large plants and warehouses—often to blanket frequently opened doors with a curtain of warm air. Their high capacities—271,200 to 609,600 Btu—permit them to replace a number of standard units with resulting economies in equipment and installation costs.

**High-corrosion-resistant models.** For those plants faced with severe internal corrosion problems requiring the frequent replacement of heating equipment—Modine offers the Power-Throw in HCR (High Corrosion Resistant) models.

*Ask the Modine representative listed in the Yellow Pages for Catalog 157 that also covers the broad range of standard Modine horizontal and vertical delivery unit heaters. Or write Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wisconsin.*

SU-1348



Air conditioners | Convectors | Cabinet units | Gas unit heaters | Steam & hot water unit heaters | Duct furnaces

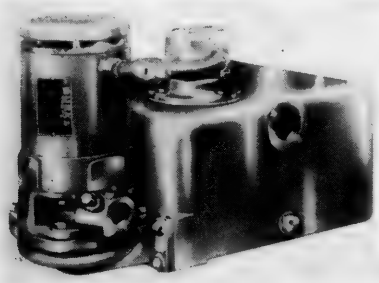
In Canada: Sarco, Ltd., Toronto

**Modine**
MANUFACTURING COMPANY

*(Continued from page 122)*

## Packaged Condensate System

Decatur Pump Co., Decatur, Ill., has introduced factory-assembled Burks condensate systems using the company's ⅓-hp IHV centrifugal pumps on cast iron receiver tanks. Both single and duplex pump systems are rated, with a 3-to-1 safety factor, for capacities up to 12,000 sq ft of radiation and up to 20 psi operating pressure.



Frequent delivery to the boiler, important especially on small heating systems, is insured by accurate controls and the fact that return of two gallons into the receiver tank starts the pump. The receiver tank inlet is only seven inches above the bottom of the tank.

All pumping parts are made of non-corrosive bronze, and pumps are equipped with drip-free mechanical shaft seals. These centrifugal pumps will not steam-bind because there is a positive head on the suction. Unusually large pump inlet assures low velocity at the pump, besides reducing friction loss.

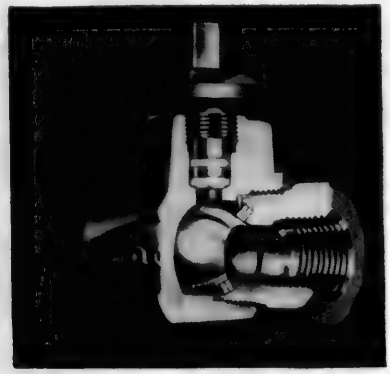
Completely assembled, both single-pump and duplex models need only two pipe connections to be put into operation. Both systems are fully automatic. In duplex systems, alternate use of pumps is made automatic by a built-in mechanical alternator.

**More information? Circle Item 38, postcard, last page.**

## Plug Type Ball Valve

A plug type, non-lubricated ball valve is announced by W-K-M, Houston, Tex., Div. of ACF Industries, Inc.

Under development and test for some time, the valve has been successfully used by widely diverse industries including chemical plants of all types, high octane fuel blending installations, and off-shore crude oil manifolds.

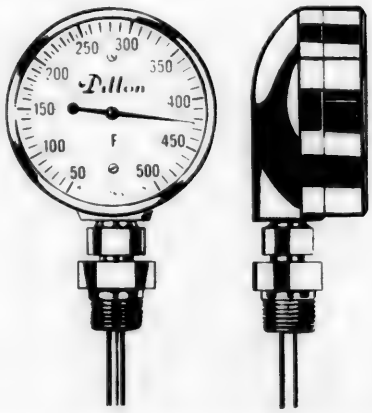


Outstanding characteristic of the ball valve is its leak-proof two-way seal with round, full-pipe area. Other features are quarter-turn opening and closing, fully protected seating surfaces, chrome-plated ball for extra resistance to wear and corrosion, and a minimum number of parts with resulting minimum maintenance.

**More information? Circle Item 39, postcard, last page.**

## Straight Form Thermometer

A straight form model has been added to its line of stainless steel thermometers by W. C. Dillon & Co., Inc., Van Nuys, Calif. An adjustable mounting nut makes it possible to turn and lock the head in position for maximum visibility.




Straight form construction is well adapted to installations on top of tanks, boilers, in high locations, or other areas where it would be impractical to utilize the standard angle form unit. Made in 3 and 5-inch head sizes, many stem lengths and ranges are available.

**More information? Circle Item 40, postcard, last page.**

## Registers and Grilles

A complete line of air conditioning registers and grilles will be marketed by Standard Stamping & Perforating Co., Chicago, Ill. A comprehensive choice of models will be offered, including a new HV Series. This efficient register has two banks of adjustable face bars. One bank has individually adjustable horizontal face bars, and the other individually adjustable vertical face bars. This arrangement is said to provide exceptionally even, gentle air distribution. The series will be available in a wide variety of sizes, with either multi-louver or opposed blade dampers.

The company's air conditioning line will also include fixed-bar return air grilles, made with a large percentage of open area. These grilles will have fixed bars, which can be pre-set for either straight flow or downward deflection. All models are designed to blend with contemporary interior design motifs. Heavy gage steel construction is used throughout.

**More information? Circle Item 41, postcard, last page.**

*(Continued on page 126)*

*Sarco offers you this big Plus . . .*

## Complete Quality Lines of

# SARCO RADIATOR VALVES

## for steam and hot water

***PLUS THE ADVANTAGES OF UNDIVIDED RESPONSIBILITY***
**...for these radiator valves and a wide variety of other steam and hot water heating specialties.**

What do you look for in radiator valves? Extra dependability? Long life and easy maintenance? Fine workmanship? You get all of these advantages in Sarco Radiator Valves . . . made to traditional Sarco high quality standards.

No matter what your need . . . there is a Sarco Radiator Valve to meet it. For steam . . . Bellows-Packless, Spring-Packless and Gland-Packed types. For hot water . . . Spring-Packless and Gland-Packed types.

Globe, angle, and corner patterns. Gate type. Modulating and quick-opening. For various pressures up to 150 psi.

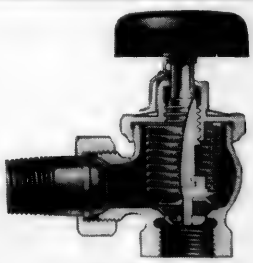
**Write for Bulletin 150-B**

Contains complete information about these quality radiator valves and their many design and construction advantages.

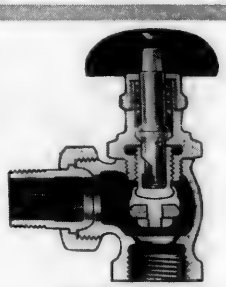
*For Sarco Undivided Responsibility*—for the convenience and dependability it insures—specify and order from one "Complete Line" source . . . SARCO-SARCOTHERM . . . radiator valves and traps, balancing fittings, and many other heating specialties. Write for bulletins.

**SARCO COMPANY, INC.**
EMPIRE STATE BLDG., NEW YORK 1, N. Y.

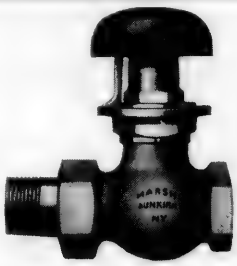
**SARCO**
AN AFFILIATE OF SARCOTHERM CONTROLS, INC.



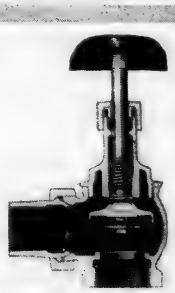
**Sarco No. 45**
**Bellows-Packless Steam Radiator Valve**
**Modulating Type**



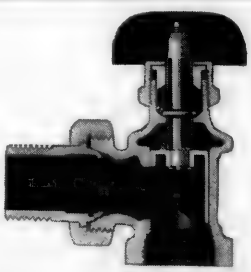
**Sarco No. 1141**
**Spring-Packless Steam Radiator Valve**
**Quick-Opening Type**
**(Also, for hot water, No. 1137)**



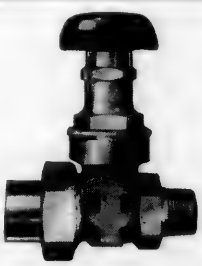
**Sarco No. 1247**
**Spring-Packless Steam Radiator Valve**
**Modulating Type**
**(Also, for hot water, No. 1239)**



**Sarco No. 1126**
**Gland-Packed Steam Radiator Valve**
**For 125 psi**



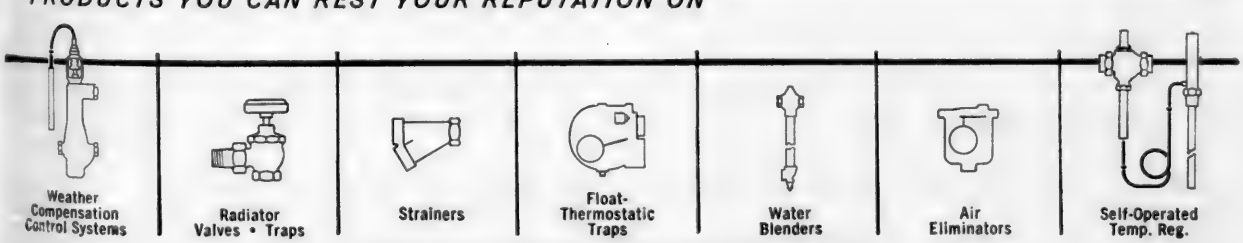
**Sarco No. 157**
**Gland-Packed Hot Water Radiator Valve**
**Sleeve Type**



**Sarco No. 129**
**Spring-Packless Convector**
**Gate Valve**

2223-B

*PRODUCTS YOU CAN REST YOUR REPUTATION ON*



Weather Compensation Control Systems | Radiator Valves • Traps | Strainers | Float-Thermostatic Traps | Water Blenders | Air Eliminators | Self-Operated Temp. Reg.

**For Heating Control Systems, see Sarcotherm ad, pages 60-61.**

*(Continued from page 124)*

## Brass Needle Valves

A line of low-priced brass needle valves is announced by Generant Engineering Co., Newark, N. J. They are suitable for air and liquid applications up to 600 psi and can be used as shut-off or throttling valves. The valves are machined entirely from brass bar stock. Overall length is only 1⅝ inches.

Gasket between the bonnet and body is eliminated by means of tapered metal-to-metal seat. Valves are available from stock in all combinations of ⅛ and ¼-inch male and female pipe ports and in ⅜-inch male pipe ports. A detailed bulletin is available.

**More information? Circle Item 42, postcard, last page.**

## Compression Couplings

A new line of compression couplings for connecting small pipe for utility and industrial use is manufactured by Wm. E. Pratt Foundry Div., Joslyn Mfg. and Supply Co., Chicago, Ill.

The compression couplings consist of only 3 components: two compression nuts with integral retaining rings and gaskets, and one steel sleeve. They are easy to install, requiring no thread cutting or exact pipe fitting. The ends of the pipe are merely stabbed into factory-assembled couplings and the compression nuts tightened.

Special construction of the steel retaining rings allow the nuts to be screwed up easily on the sleeve and to compress the gaskets without friction or seizure. This assures permanent, leak-proof joints, capable of withstanding and sealing internal pressures in excess of 3000 psi, for pipe lines in sizes from ¾ to 2-inch IPS.

**More information? Circle Item 43, postcard, last page.**

## Air-Cooled Conditioner

Completely packaged 3 and 5-ton air-cooled remote air conditioners are offered by Cobell Industries, Inc., Fort Worth, Tex.

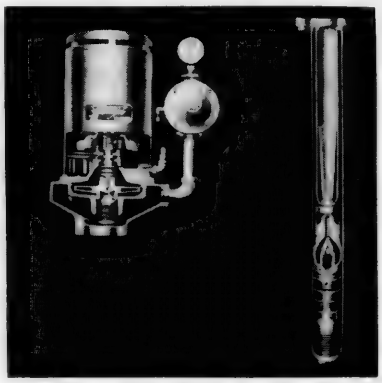
Model A-573 has cooling capacity of 36,500 Btu for 220-volt, 3-phase, or 230-volt single-phase service, and weighs 520 lb. Model A-575 has 57,700-Btu capacity, the same electrical characteristics, and weighs 584 lb.

Heavy-duty Copelamatic compressor (for F-12) has 5-yr guarantee. Other components: condenser-blower protected by safety discharge grille, oversize receiver for full-system capacity that permits winter pump-down, prewired control center, suction and liquid line connections. Package is waterproof for installation outdoors.

**More information? Circle Item 44, postcard, last page.**

## Over-the-Well Pumps

Vertical Bud-Jet Series VJ pumps for over-the-well installations are announced by Aermotor Co., Chicago, Ill. A pump casing is offered for 2-inch packer wells, for 3-inch packer wells, and for 2-pipe operation.



Packer units clamp directly to well casing without the use of additional casing head. Entire unit is factory assembled with pressure regulating valve.

To give pumps ability to handle air or gas, in the event of gaseous wells, seal chamber is connected to the regulating valve at a higher level, so that air or gas cannot be trapped. This feature eliminates a manual vent cock which would normally have to be opened by hand during priming.

**More information? Circle Item 45, postcard, last page.**

## New Gasketing Materials

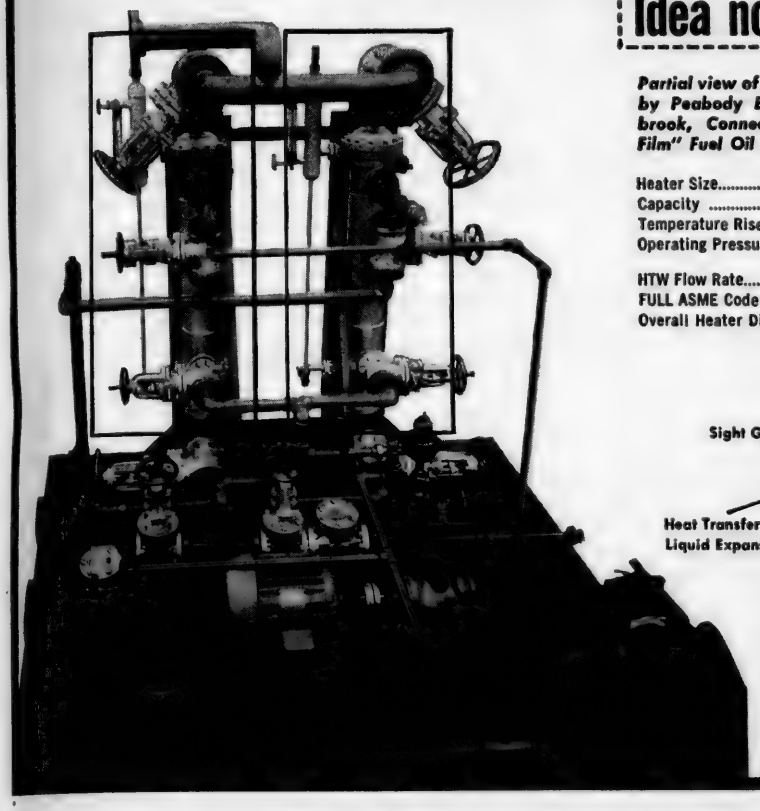
Five new high-density fiber gasketing materials, that make it possible to obtain seals at lower flange pressures, have been developed by Industrial Division, Armstrong Cork Co., Lancaster, Pa. The materials enable the company to offer a more complete line in the Accopac series, a recently developed group of gasketing materials that have more flexibility, dimensional stability and uniformity than conventional fiber gaskets.

There are now 15 of these gasketing materials for applications having flange pressures in excess of 800 psi, for both low and high temperature applications. The materials may be used in applications involving any type of fluid because Accopac is available with either nitrile, styrene, or Neoprene binders.

**More information? Circle Item 46, postcard, last page.**

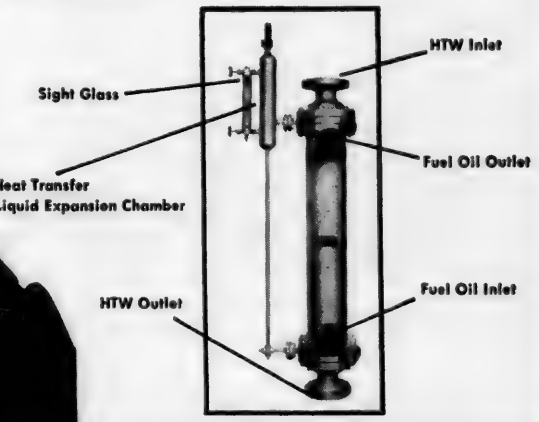
*(Continued on page 128)*

## Idea no. 2 from Paracoil



*Partial view of pump and heater set fabricated by Peabody Engineering Corporation, Glenbrook, Connecticut, utilizing two "Thermo-Film" Fuel Oil Heaters of these specifications:*

| | |
|---|---|
| Heater Size | FF-48 HTW "Thermo-Film" |
| Capacity | 7500 lbs. No. 6 oil per hour |
| Temperature Rise | 80°F to 210°F |
| Operating Pressures | 300 psi, water side<br>315 psi, oil side |
| HTW Flow Rate | 100 GPM at 370°F |
| FULL ASME Code Construction | |
| Overall Heater Dimensions | 15" x 6'-6" |




# How to use High Temperature Water directly in a #6 oil heater...without danger of system contamination!

***The Problem***

The pre-heating of #6 fuel oil with High Temperature Water to provide adequate oil temperature and eliminate possibility of leakage of fuel oil into the HTW stream.

Leakage of fuel oil into the HTW stream would result in contamination of the system and could cause serious and costly damage to the boiler and the entire system.

The isolation of the fuel oil heaters can be accomplished by several methods. For example, the HTW stream may be passed through an evaporator to supply steam for use in a steam-type fuel oil heater. Or, the HTW stream may be passed through an intermediate water-to-water exchanger to heat a secondary water stream circulated through a water-type fuel oil heater.

In both of these systems, the HTW stream is safely isolated from the fuel oil heater by an intermediate secondary circuit. But effective as these methods are, they both require a minimum of two heat exchangers, additional space and additional connecting piping, regulators, level controls, etc.

***A New Solution***

Now for the first time the Paracoil "Thermo-Film" Fuel Oil Heater furnishes the optimum solution to the problem. **In a single exchanger** the "Thermo-Film" Heater provides adequate oil temperature, isolation of the HTW circuit from the oil circuit, a reduction in space requirements, simplicity of operation and substantially lower initial installation cost. A number of double tube elements are enclosed within the heater shell providing three circuits: the primary HTW circuit, an intermediate heat transfer fluid circuit, and the oil circuit.

The heat flow path is from the HTW to the heat transfer fluid to the fuel oil. In the rare event of an oil tube failure, the free oil cannot contaminate the HTW stream as it becomes trapped in the intermediate space containing the heat transfer liquid, and gives warning to the operating personnel by rising in the indicating gauge glass at the expansion chamber.

Your inquiries for Paracoil "Thermo-Film" applications to HTW systems are invited.

CUT ALONG DOTTED LINE AND SAVE

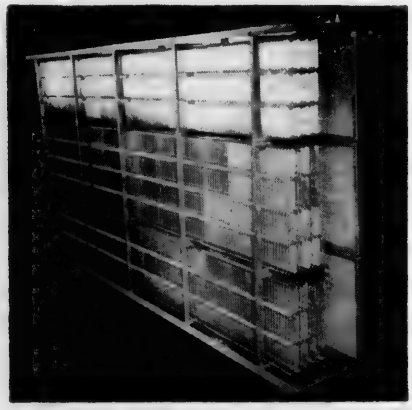
**DAVIS ENGINEERING CORPORATION**

**30 Rockefeller Plaza, New York 20, New York • Circle 6-5650**

*(Continued from page 126)*

## Multiple Electrostatic Filters

An electrostatic air cleaner developed by Radex Corp., Chicago, Ill., uses company's Dustronic principle but saves materially in space, face area, and at the same time increases capacity.



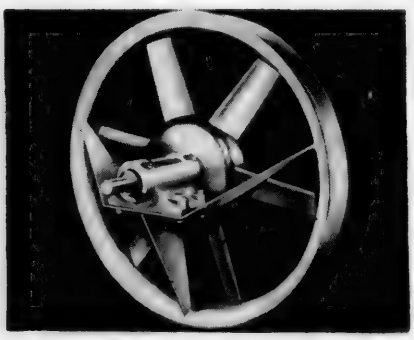
Multiple section unit can be manufactured in any multiple of 5½ inches, depending on the size of the duct space available. For example, electrostatic filters can be made in sizes 5½ x 9 up to 28 x 144, and yet the collector plates can be removed for cleaning in a space of less than 24 inches. The depth of the unit is only 18 inches, while the height and length can be varied to fit the particular requirements. No water or sewer connections are necessary and the unit does not generate ozone.

Mechanical filters are connected in multiples and can be withdrawn from the unit for cleaning purposes within a space of 25 inches. These units can be installed at an angle.

**More information? Circle Item 47, postcard, last page.**

## Belt-Driven Orifice Ring Fan

A belt-driven orifice ring fan, designed for operations using diesel, gasoline, steam, or electric motors, is developed by Chicago Blower Corp., Franklin Park, Ill. Known as the Type PD, unit incorporates an oversized shaft to accommodate maximum horse-power used and is suitable for V-belt or flat-belt pulley operations. By changing



pulley diameters, unit may be adapted to crop drying, cooling of special equipment, or exhausting of various acids and fumes.

Aerodynamic blade design produces a high-pressure air pattern without dead spots, it is said. One piece, hollow blades, large at the hub, decrease to small sizes at the tips, causing even distribution of air velocity over entire blade surface.

In 10 sizes, ranging from 12 to 72 inches, wheels are available with either 2, 4, 6 or 8-bladed steel or aluminum, depending upon pressure requirements and individual specifications. Orifice ring is constructed of die-formed, one piece heavy sheet steel.

**More information? Circle Item 48, postcard, last page.**

## Conditioner Line Expanded

Two more packaged air conditioning lines are announced by Drayer Hanson Div., National-U.S. Radiator Corp., Los Angeles, Calif., bringing to six the number of systems added to its lines this year.

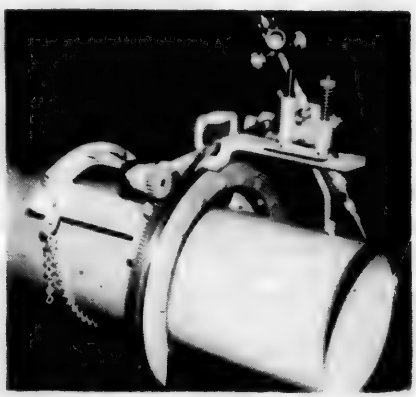
One line, designated Royal-aire, is available in 3, 5, 7½, 10, and 15 hp. A cabinet type, it is primarily for commercial and industrial application.

The second line, designated Dyna-Pac, is for light commercial and residential application. It is being manufactured in 2, 3, and 5-ton sizes, free blow or duct type, option of air or water-cooled. Larger sizes will be added.

**More information? Circle Item 49, postcard, last page.**

## Out-of-Round Attachment

H & M Pipe Cutting and Beveling Machine Co., Tulsa, Okla., has announced an improved design in the Out-of-Round attachment for their standard pipe cutting and beveling machines. Working on the spring-tension principle, the spring and a roller rod assembly is engineered

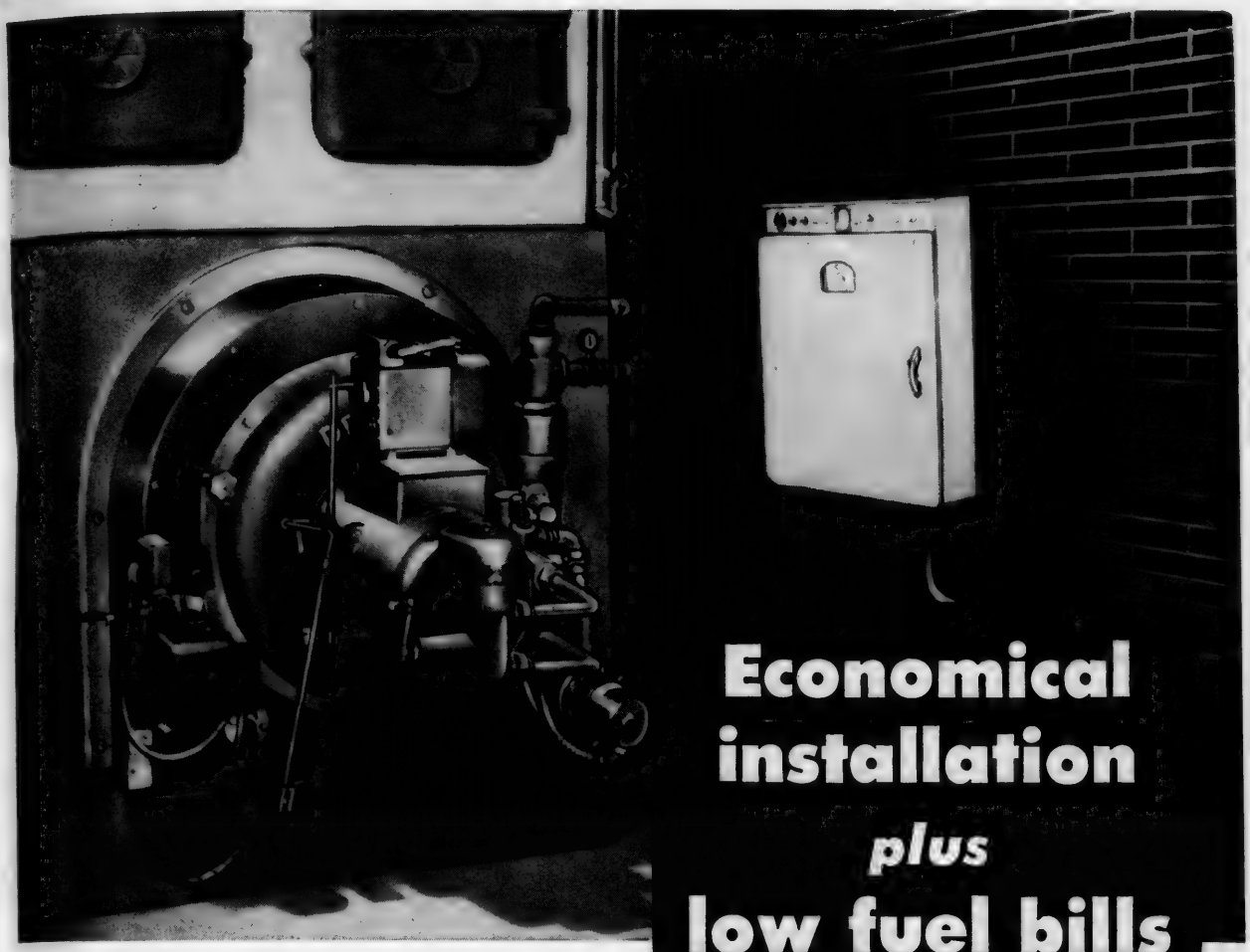


to eliminate the problem of inaccurate cuts or bevels on out-of-round or imperfect pipe.

The roller rod assembly consists of a rod that is fastened to the body of the attachment by means of a set screw arrangement, and a small diameter wheel that is affixed to the end of the rod, which travels the outer circumference of the pipe surface. Through the action of the spring, constant pressure is applied to the roller rod, which forces the wheel to follow the contour of the pipe. This maintains the torch equidistant from the pipe at all times, thus correcting for any defects in the surface.

**More information? Circle Item 50, postcard, last page.**

*(Continued on page 130)*



# Economical installation *plus* low fuel bills

## New PETRO burners include advanced features that cut heating costs

Equipped with factory designed combustion chamber and air intake register, these modern burners assure maximum combustion efficiency at all firing rates. Air necessary for combustion, unless properly adjusted to any change in oil feed rate, affects efficiency and firing characteristics of any burner. In the new Petro burners, air is precisely controlled with an integral air register. No separate air supply is required.

### For oil or combination gas-oil firing

These Petro burners operate with equal combustion efficiency and economy whether firing oil or gas. Existing Petro rotary oil burners can be converted to combination gas-oil firing by the addition of an air register with gas ring and controls.

### Can be used with any boiler

The new Petro burners will fit any boiler. A simple adapter ring makes this possible. This reduces installation costs and results in additional savings.

### You can bank on Petro dependability and economy

The dependability of the Petro burner is well known. The unit is thoroughly engineered, simple in design, ruggedly constructed and economical in operation. Thousands of Petro owners testify to worry-free heating, with low fuel and maintenance costs.

**Send for free literature.** For more information and specifications, please mail the coupon.

PETRO
REG. U. S. PAT. OFF.

MAKERS OF QUALITY HEATING AND POWER EQUIPMENT SINCE 1903

PETRO
3525 West 106th Street, Cleveland 11, Ohio
(In Canada: 80 Ward Street, Toronto, Ont.)
Please send me literature and specification sheets on money-saving Petro Gas-Oil Burners.

Name.....

Company.....

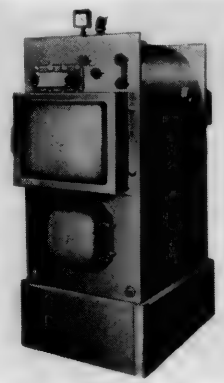
Address.....

City.....State.....

*(Continued from page 128)*

## Three-Pass Heating Boiler

A three-pass boiler called the TP Series is introduced by Portmar Boiler Co., Inc., Brooklyn, N. Y. Designed to supply the steam and hot water requirements of today's large structures such as apartment houses, commercial and public buildings, industrial plants, institutions, schools, hospitals, and housing projects, this three-pass steel heating boiler has several new features.



Assuring maximum efficiency and economy, this three-pass system is claimed to extract full usable heat resulting in complete absorption of heat by surrounding boiler water. Flue gases pass through the full, high, and wide firebox area first along the firebox crown sheet to the rear of boiler; then through the lower row of tubes to the front of boiler, and back again through the upper row of tubes. A large steam dome is said to supply a reserve of dry quality steam, and an added feature designed for maintenance men is a gas-tight, rear clean-out door for firebox tubes. The tubes are made accessible from the rear for repair, thorough cleaning, and inspection.

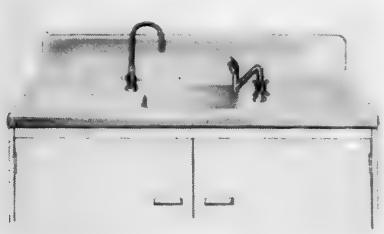
ASME constructed and stamped, and SBI rated, this three-pass boiler is available in 16 sizes, oil or gas fired. Steam capacities are rated from 3650 to 42,500 sq ft: water capacities from 5840 to 68.000 sq ft. Working pressures with steam is 15 psi; with water 30 psi. The unit is also available for 100 psi working pressure for water.

**More information? Circle Item 51, postcard, last page.**

## Deck-Top Unit Includes Fountain

A complete one-piece deck-top, receptor, and fountain unit molded in light weight fiberglass is introduced by Haws Drinking Faucet Co., Berkeley, Calif. The Series 2500 units are available in white and a selection of five decorator colors. They are particularly designed for varied school applications.

A feature of this new product is the complete absence of



any rims, cracks, or joints, thereby eliminating undesirable dirt and water accumulation. Water runs unhindered from deck-top to receptor. Units, in standard lengths of four and six feet, and 24-inches deep, are furnished with integral backsplashes and endsplashes as required. Installation is easily and quickly accomplished by screwing wooden receptor backing onto a prepared frame or standard cabinet.

A wide variety of the company's drinking and pantry faucets equip this unit for varied school classroom and laboratory uses. All fixtures are vandal-proof to prevent turning.

**More information? Circle Item 52, postcard, last page.**

## Liquid Level Control

A liquid level control valve manufactured by Mansfield Sanitary, Inc., Perryville, Ohio, is furnished with ratchet and thumb screw connection on actuating arm and float rod holder. This is said to permit easy positioning of float to obtain correct liquid level. Also, complete lever mechanism can be swiveled around in 360-deg circle to accommodate any lateral force.

According to the manufacturer, the valve plunger is specially designed to prevent leaks and chatter. Its lower end is fitted with heavy-duty neoprene washer that screws on for tight fit. O-ring at its center prevents seepage around stem. The entire plunger is readily removable.

Of cast bronze construction throughout, valve is equipped with ½-inch inlet and ½-inch outlet. It is offered with either 12-inch rod and float, or chain and float with choice of plastic or copper float. Valve is recommended for installation in cooling towers, stock tanks, poultry troughs and any other location where a constant liquid level is required.

**More information? Circle Item 53, postcard, last page.**

## New Rotameter Floats

A result of an intensive standardization program by Brooks Rotameter Co., Lansdale, Pa., is a new metering float design providing interchangeability and predictability of performance.

To the rotameter user this means a minimum of spare part inventories. Technical improvements in design permit one float to be used in any application from common flow indication to remote pneumatic or electric transmission or alarm functions. Complete adaptability to the most advanced types of instrumentation is assured.

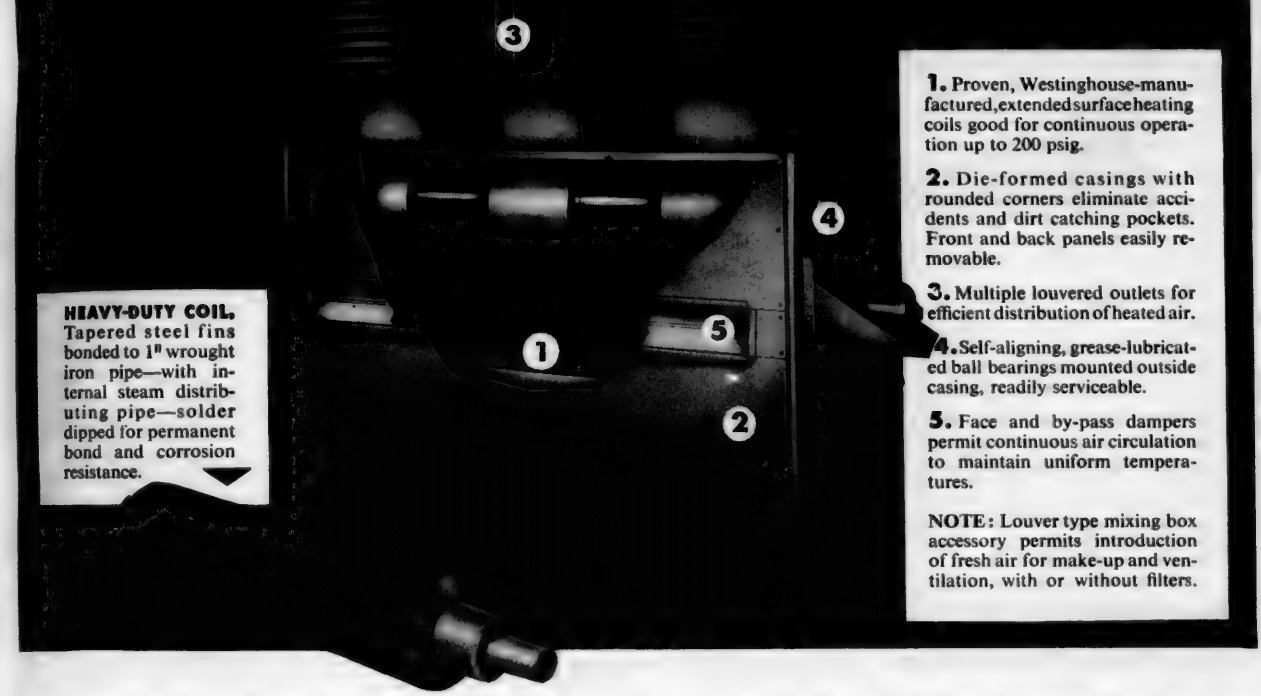
Bulletin 115 describes the basic metering element as applied to the company's Full-View rotameters.

**More information? Circle Item 54, postcard, last page.**

*(Continued on page 132)*

# Fact:

## Rugged Westinghouse Industrial Heaters available in 24 Sizes . . . 8 Coil Selections . . . 150 Ratings from 100,000 to 2,500,000 BTU/hr . . . 2,000 to 25,000 CFM each




**HEAVY-DUTY COIL.** Tapered steel fins bonded to 1" wrought iron pipe—with internal steam distributing pipe—solder dipped for permanent bond and corrosion resistance.

**1.** Proven, Westinghouse-manufactured, extended surface heating coils good for continuous operation up to 200 psig.

**2.** Die-formed casings with rounded corners eliminate accidents and dirt catching pockets. Front and back panels easily removable.

**3.** Multiple louvered outlets for efficient distribution of heated air.

**4.** Self-aligning, grease-lubricated ball bearings mounted outside casing, readily serviceable.

**5.** Face and by-pass dampers permit continuous air circulation to maintain uniform temperatures.

**NOTE:** Louver type mixing box accessory permits introduction of fresh air for make-up and ventilation, with or without filters.

Solve your space heating problems with Westinghouse-Sturtevant Industrial Heaters. Eliminate cold, drafty conditions caused by excessive cold infiltration through leakage or exhaust.

### *Two Types With Wide Applications:*

**GENERAL PURPOSE HEATER . . .** For manufacturing areas, warehouses, garages, commercial buildings—with standard non-ferrous heating coils.

**HEAVY-DUTY HEATER . . .** For continuous-duty high-pressure systems, or industrial process work—with wrought iron heating coils.

The compact packaged engineering of every Westinghouse-Sturtevant Industrial Heater provides units for mounting on floor, walls, or suspended from ceilings. In short, they can be placed where they will do the most good, and can be relocated to meet any change in plant layout.

Every unit is backed with a Westinghouse exclusive—*one warranty*. Only Westinghouse makes all principal components—Fans, Heating Coils, and Motors. You can get unit engineering and single equipment responsibility.

**MORE FACTS?** To find out how to solve your particular heating problem, call your Westinghouse-Sturtevant Sales Engineer . . . he is the "Man With The Facts" on heating, air handling, and electronic air cleaning . . . or fill in coupon below.

**WESTINGHOUSE AIR HANDLING**

YOU CAN BE SURE...IF IT'S

**Westinghouse**

Westinghouse Electric Corp.
Sturtevant Division, Dept. 17A
Hyde Park, Boston 36, Mass.

*Please send more information on your Industrial Heaters.*

NAME AND TITLE .....

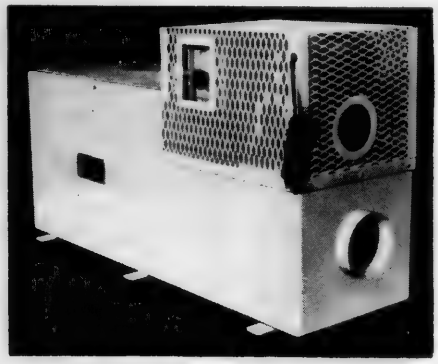
COMPANY .....

CITY ..... STATE .....

*(Continued from page 130)*

## Holds Humidity to ± ¼%

Development of a controller for delivering constant humidity air has been announced by the Universal Dynamics Corp., Arlington, Va. Called Humitrol, it is said to maintain humidity level within ± ¼% rh, or better, in an air or gas stream.



Unit is composed of a sensing element, control system, and modulating device, all integrally mounted, and is for use, as illustrated, in conjunction with dehumidifiers, humidifiers, and air conditioning equipment. It is available in sizes ranging from 20 cfm up. The control point is set by adjusting a calibrated knob. Operating over a wide temperature span, the unit is accurate in a 3 to 98% relative humidity range, the company states.

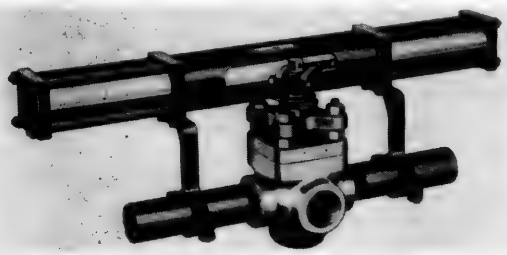
Typical applications include drying ovens for plastic compounds, laboratories, Freon handling operations, drug processing, industrial process control, and generally in all installations where a flow of constant humidity air or gas is required.

**More information? Circle Item 55, postcard, last page.**

## Plug Valve Operators

Designed for use with air, gas, oil, or water at pressures up to 200 psi is a line of medium-duty plug valve operators offered by Ledeen Mfg. Co., El Monte, Calif.

These valve operators are adaptable to a wide range of control requirements, including process cycling, safety, and automatic shut-offs, or any combination of these requirements.



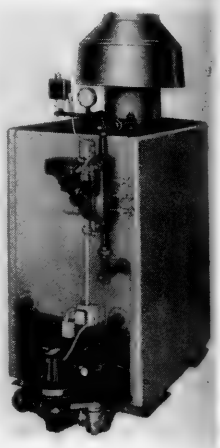
Model FM is for use on valves requiring relatively low torques. It is a floating bar type operator incorporating two single acting cylinders. Model TM is designed for valves requiring higher torques. This operator utilizes two double acting cylinders. Model QM consists of two Model FM or TM operators mounted on a common mounting bracket. In a given size this operator has twice the torque capacity of the same size FM or TM unit.

Line of operators offers a torque range up to 94,000 inch-lb. A dual pipe mounting bracket is available for Model FM and TM valve operators for easy field installation. Bonnet and flange type valve mounting brackets are also available. A wide variety of control valves can be supplied for automatic or remote operation of these valve operators.

**More information? Circle Item 56, postcard, last page.**

## High-Pressure Steam Boilers

There are 7 boilers in the Series 600 high-pressure steam boiler line, manufactured by Bryan Steam Corp., Peru, Ind., ranging from 4 to 50 hp and with Btu output ratings from 134,000 to 1,680,000. Designed specifically for fast steam, the boilers are equipped with either gas or oil firing. Burner units, insulation, and controls are all assembled at the factory.



Large-volume water legs assure rapid internal water circulation in the firebox section. Controls are all front mounted for complete accessibility and convenience. A removable side section gives complete access to the oil or gas burner combustion chamber. A large rear access door simplifies interior inspections and service.

The heart of this boiler is said to be in the copper tube assembly. The heat conductivity of copper being several times that of cast iron or steel, an exceptionally fast heat transfer rate from flame to water is claimed for the boiler.

**More information? Circle Item 57, postcard, last page.**

## Booster Is Also Storage Heater

Approved by AGA for 180-deg water, its new line of booster and high-capacity storage water heaters is announced by Rheem Mfg. Co., Chicago, Ill.

Available in both 45 and 75 gallons, with two input ratings for each size, from 70,000 to 180,000 Btu per hr, units feature thermostat, regularly installed in water heater proper, which can be removed and installed in the hot water storage tank that receives heated water from the booster. All components are assembled in kit form, including armored cable lead wire and galvanized plug to be placed in opening originally used for thermostat.

Of importance to wholesalers and contractors, a second thermostat may be installed to convert the booster into a storage unit for installations where it is not feasible to have a separate storage tank. Booster then becomes a high capacity storage heater.

**More information? Circle Item 58, postcard, last page.**

*(Concluded on page 134)*

"Chicago"

MODERN TODAY
MODERN IN 2007 A.D.

# WORLD'S FIRST BRONZE SKYSCRAPER HAS CHICAGO "FLUSH KLEEN"® SEWAGE PUMPS

375 Park Avenue — New York

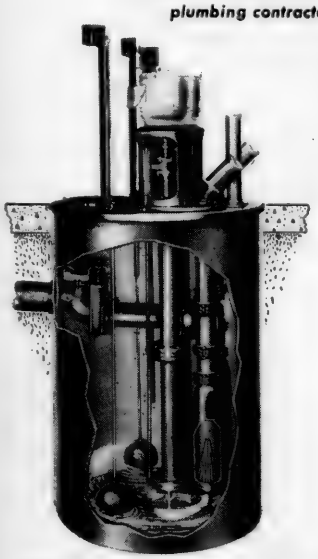
**MIES van der ROHE and PHILIP JOHNSON**
*architects*

**KAHN & JACOBS**
*associate architects*

**JAROS, BAUM & BOLLES**
*mechanical engineers*

**GEORGE A. FULLER CO.**
*general contractors*

**EUGENE DUKLAUER, INC.**
*plumbing contractor*



**"FLUSH KLEEN"® Sewage Pump . . . Automatically Backwashes Strainer . . . Strainer Keeps Solids From Basin and Pump . . . Water Only Handled By Impeller.**

• The new 375 Park Avenue Building, New York, literally has EVERYTHING— and *everything* is QUALITY. Quality ideas, plans, materials and workmanship have provided such modern conveniences as year-round peripheral zoned air conditioning with balanced humidity and finger-tip control, 18 electronically controlled high-speed elevators, closed circuit color television, special non-glare exterior glass walls, etc. Chicago "FLUSH KLEEN"® Sewage Pumps have provided for continuous, trouble-free waste disposal service.

More than 12,000 Chicago "FLUSH KLEEN"® Sewage Pumps have been installed as standard equipment in fine buildings everywhere — and NOT ONE HAS EVER CLOGGED. Only liquid reaches the pump impeller. There is no contact between the pump's working parts and coarse sewage material.

This is why Chicago Pump Company "FLUSH KLEEN"® Sewage Pumps have an unequalled record of clog proof performance and are preferred throughout the building industry.

**CHICAGO PUMP COMPANY**
Building Pumps
Subsidiary of Food Machinery & Chemical Corporation
fmc FOOD MACHINERY AND CHEMICAL CORPORATION

*(Concluded from page 132)*

## Additional Plug Valve Sizes

New sizes in plug valves for wider application are now available from Circle Seal Products Co., Pasadena, Calif.

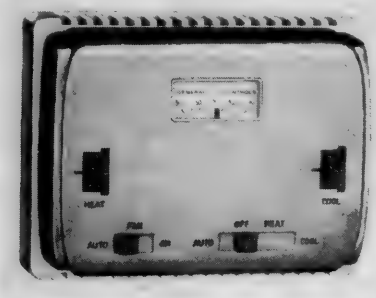
Design features include dead tight shut-off through use of O-ring flow seal and O-rings at top and bottom to prevent external leakage. In the open position, the valve is full ported and allows a straight-through flow passage. The design eliminates adjusting nuts and springs making the valve adjustment and maintenance free for long service life.

These plug valves are operated by handles that open and close against pressure without effort, and are available in ¼, ½, and ¾-inch pipe sizes. The ¼-inch size is now available in stainless steel with a new aluminum handle. Other sizes are available in brass.

**More information? Circle Item 59, postcard, last page.**

## 4-Position Selector Switch

A new, 4-position selector switch that provides the operator with a choice of either manual or automatic system changeover has been added to their line of Series T-240 air conditioning thermostats by General Controls Co., Glendale, Calif. This feature now provides the air conditioning industry with a highly versatile thermostat




for controlling air conditioning systems up to two-stage heating and two-stage cooling.

The new selector switch contains *auto, off, heat* and *cool* positions, which may be positioned by one sliding button. Another switch located alongside adds to this thermostat's operating flexibility by providing independent fan operation for air circulation without actuating the heating or cooling equipment.

All combination heating-cooling thermostats are mercury-switch equipped and feature the distinctive brushed stainless steel cover providing accurate temperature sensing and lifetime finish.

**More information? Circle Item 60, postcard, last page.**

## Low-Pressure Switch

Development of a low-pressure switch to control or signal small pressures, vacuums, or differential pressures is announced by Bacharach Industrial Instrument Co., Pittsburgh, Pa. It is well suited for control of movement of roll-type air filters, pressure regulation of gas boosters, switch operation of dampers, blowers, gas-fired heaters, and for similar low-pressure control, safety or signaling applications. An independently adjustable automatic reset feature extends the use of the switch to many automatic control fields.

The switch can be mounted in any position, and its operation is not affected by vibrations. It requires only 1½ inches head room. Pressure, vacuum, or differential pressure will operate the switch. Normal range is from 0.1 to 5.0 inches of water, but other ranges can be provided. Switch is designed for use on a-c and d-c current up to 110 volts.

**More information? Circle Item 61, postcard, last page.**

## New Welding Blowpipe

The Oxweld W-47 blowpipe, a medium-pressure welding blowpipe capable of welding any metal thickness from 28 gage to 3 inches is introduced by Linde Company, Div. of Union Carbide Corp., New York, N. Y. With its complete selection of welding and heating heads, extensions and accessories, the new blowpipe offers the greatest welding and heating range ever available in a single blowpipe, company states.

The blowpipe handles any oxygen or acetylene flow from 2 to 300 cfh. Fuel gas heating heads are available for use with total gas flows as high as 1500 cfh. A simple change of welding heads quickly converts the blowpipe from light-duty welding and brazing to heavy-duty welding or heating. This feature enables the device to handle a range of work normally requiring two or more blowpipes. A convenient cutting attachment equips the blowpipe for flame-cutting on metal up to 8-inches thick.

**More information? Circle Item 62, postcard, last page.**

## Water Pressure Analyzer Kit

A water pressure analyzer kit which can solve many field problems dealing with pressure and flow rates is offered by The F. E. Myers & Bro. Co., Ashland, Ohio.

Time consuming problems which can be solved in minutes by the use of the kit include pressure drop across a water conditioner, water carrying capabilities of piping systems, pump performance, locating obstructions in piping systems, and checking a water system's ability to backwash a water conditioner.

The kit includes a brass adapted coupling, street tee, bushing, pressure gauge, three different flow control regulators, and hose fittings and gasket. The flow control regulators are in 2½, 4 and 6-gpm sizes. An 11½-gpm flow controller also is available.

**More information? Circle Item 63, postcard, last page.**

# Specify RECO

D. C. Hospital Center, Washington
Mechanical Contractor:
Standard Engr. Co., Inc., Washington, D. C.
RECO Representative:
Maloney Engr. Co., Washington, D. C.

## RECO Hot Water on Duty at D. C. Hospital Center!

When three Washington hospitals merge into one huge D. C. Hospital Center, the hot water demands will be enormous.

RECO hot water storage heaters and tanks were designed to meet and beat these hot water needs. Twenty-nine pieces of RECO heat exchange equipment will keep thousands of gallons of hospital-pure hot water always on tap for the new 800-bed center. Hundreds of hospitals from coast to coast now rely on round-the-clock hot water service by RECO.

Let *RECO* fill *your* hot water needs. On your next job—specify the full line of RECO Hot Water Storage Heaters, Convertors and Instantaneous Heaters.

For name of nearest RECO representative, write Dept. R, RECO, 7th & Hospital Sts., Richmond 5, Va.

**RICHMOND ENGINEERING CO., INC.**

# PRODUCT APPLICATIONS

## New, Unusual, or Ingenious Uses of Equipment and Materials

### High Velocity Air Conditioning For Mr. Arthur and Crew

When Alabama Dry Dock & Shipbuilding Co., Mobile, Ala., received the contract to build the drilling barge, "Mr. Arthur," the air conditioning system first considered was to consist of a central plant for heating or cooling the primary air delivered to room units by a duct system. Room temperature was to be controlled by passing the primary air and induced room air over water coils in the room units. The temperature of these coils was to be thermostatically controlled by a valve in the water supply line. However, in comparing this with a dual duct, all air, high velocity system, it was decided that high velocity would be more economical for the owner and for the shipyard.

The air handling unit for the high velocity system contains the filters, cooling coils, and fans. The filters are conventional dry air filters with fibrous glass as the medium. The cooling coils are direct expansion coils with Freon-12 as the refrigerant. The fans are centrifugal high-speed fans with backward-curved blades. Due

to the limited space available the ducts were sized on the basis of 4000 fpm maximum velocity, which is higher than normal marine practice, and for a pressure drop of 1-inch wg per 100 ft of duct. For final distribution within the living spaces, sound attenuator boxes equipped with 100% induction diffusers made by Anemostat Corporation of America are used.

The control system is a fully-automatic pneumatic system with manual change-over from winter to summer operation. The manual control switch places the central plant unit on summer or winter operation, with the Freon-12 direct expansion coils employed during the summer season and electric heating elements during the winter season.

It is estimated that the saving in space, ductwork, and piping easily offsets the slight increase in cost caused by somewhat greater horsepower required for operating the system as well as absorbing the higher cost of the high-velocity diffusing units.

### Outdoor Conveyor Tube Frost Formation Eliminated by Internal Insulation

Because of extreme weather conditions (temperatures have reached as low as —50 deg F in winter). Steep Rock Iron Mines Ltd. have made plans for both surface and sub-surface mining at their new Atikokan, Ontario, mine. During the winter, a conveyor belt carries the ore from far below the surface to a "tipple" above ground. From the point where it emerges from the ground, the belt is enclosed in an 8-ft dia steel tube.

A serious problem arose, however, due to the wet condition of the ore and the severe outside temperatures. Moisture condensed on the cold surface of the tube, building up heavy frost layers over six inches thick. This seriously interfered with operation of conveyor.

At the outset, the tube was heated from within by a steam pipe and covered with an insulation. This in turn had a weatherproof coating. However, the combination of severe moisture problem within the tube and extreme outside weather conditions, caused this insulation to fail.

It was decided to reinsulate the tube, this time on the inside, using an insulation that would be unaffected by moisture. Foamglas insulation, a product of the Pittsburgh Corning Corporation, was chosen. Its composition of sealed glass cells makes it impervious to vapor and moisture. In addition, its ultimate compressive strength of over 7 tons per sq ft enabled the company to pour a concrete wearing floor for the lower portion of the tube directly over the insulation, as illustrated.

Insulation contractor was Lakehead Insulation & Suppliers Ltd. of Port Arthur, Ontario.

*(Product Applications continued on page 138)*

# 18 Football Fields

1,000,000 square feet of

# BALANCED COMFORT

IN THE NEW
DOUGLAS DC-8 JETLINER PLANT

Horizontal "HC" Heating and Ventilating Units are available in either horizontal (shown above) or vertical types (below) in 17 sizes with air deliveries from 1,280 cfm to 32,500 cfm, and capacities from 26,200 BTU/hr to 2,227,000 BTU/hr. There are four types with four or more fan discharge arrangements for each. Three types of coils are available—standard steam, jet tube steam or hot water, in both standard and heavy duty construction. A size and type for every job—each with all necessary accessories.

# 124 McQuay HEATING AND VENTILATING UNITS

New $20,000,000 Douglas Aircraft Company DC-8 Jetliner manufacturing plant, Long Beach, California.

Architects and Engineers . . . . . Holmes & Narver, Inc., Los Angeles, California

Mechanical Contractors . . . . . Southern Engineering & Construction Co., Inc., Long Beach, California

McQuay Means Quality

You may not have a million square foot job, such as the new Douglas Aircraft DC-8 Jetliner plant on your boards, but you will want to know that McQuay "HC" heating and ventilating units can handle and can produce balanced comfort over a large area—economically and practically. In the case of this Douglas plant, there are 124 McQuay HC-323 units.

The units are designed for use with high-pressure, high-temperature water, the temperature ranging from 210° F. to 400° F. with corresponding pressures.

The units are mounted at 56 foot elevation and strategically located to insure a 25 f.p.m. air motion at a 6 foot elevation.

Universal nozzles helped considerably in balancing the job by giving the desired air distribution over the entire floor area.

These versatile and flexible McQuay units can do the same for you on any job. Call in the McQuay representative near you.

# McQuay INC.

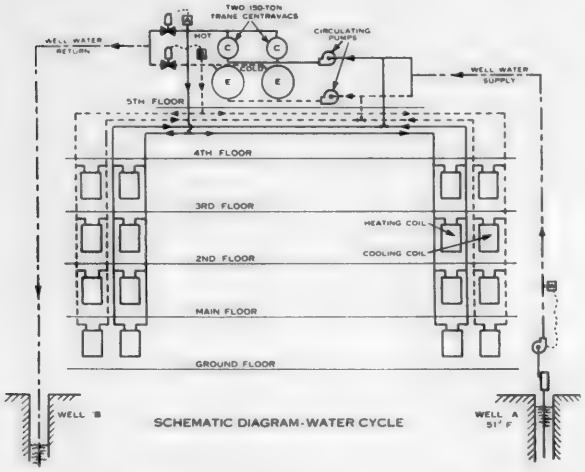
*1619 Broadway St. N.E., Minneapolis 13, Minnesota*

REFRIGERATION
HEATING
AIR CONDITIONING

## Heat Pump Selection for Utility Results in Substantial Savings

The new $2½ million Administration Office Building of the Tacoma City Light Department boasts an efficient application of a modern heat pump system. The modern, all concrete structure is 100 by 300 feet in area and consists of 4½ stories. Structural provisions have been made for the addition of four more floors.

Before designing the air conditioning system, a careful analysis was made of the building heat losses and gains throughout the expected temperature range by Worthen and Wing, Consulting Engineers in Tacoma. It was noted that the total heat loss curve and the total heat gain curve intersect at approximately 37 deg F outside air temperature. This is just a bit below the average daytime



SCHEMATIC DIAGRAM-WATER CYCLE

outside air temperature over the entire year, and also represents a typical condition over a very large number of daytime hours during the year. A condition in which maximum heat gain and heat loss are approximately numerically equal is a favorable condition for use of a heat pump system. Major items of equipment selected to handle the maximum heat loss will automatically be of a size to handle the maximum heat gain.

In addition, when total heat loss balances total heat gain at a point representing a major amount of time during the year, the heat pump system makes possible the recovery of heat gains in the internal portions of the building. When this is used in balancing the heat loss around the perimeter of the building, very substantial economies are realized over alternate systems which would involve the air conditioning of internal zones while some fuel is needed to heat exterior zones.

These factors, plus the availability of electrical power at reasonable cost, and adequate, good quality water supply for use as an economical source of heat balancing medium, resulted in the selection of a heat pump air conditioning system for the building.

The system, based on two 150-ton Trane hermetic centrifugal compressors, provides heating and cooling at less cost per year than a system that provides heating alone in another building of comparable size owned by the same utility, although, of course, initial cost was greater for the heat pump installation.

## Technique Fireproofs and Insulates Fuel Storage Tanks

A technique has been developed for protecting gasoline and oil storage tanks from the dangers of fire and evaporation loss by protecting them with perlite insulating concrete.

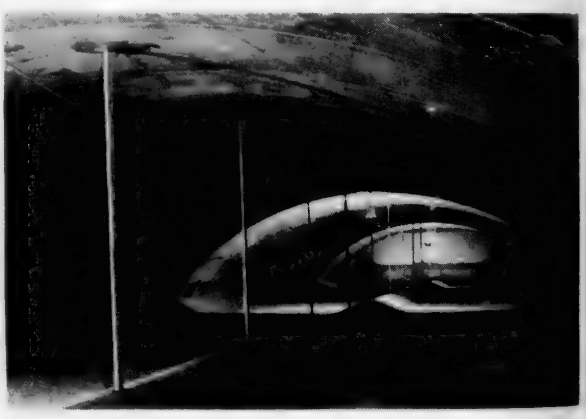
United States Gypsum Company, Chicago, recently used the new method on three medium-size fuel tanks at its Philadelphia plant. In this case, the company wanted to enlarge one of its buildings that was very close to the 50,000-gal. fuel tanks but was unable to do so because of municipal fire regulations. Approval was granted, however, after the tanks had been fireproofed with concrete made with perlite—and expanded volcanic mineral that is rapidly replacing ten-times-heavier sand in gypsum plaster and insulating concrete.

At the same time the perlite concrete serves as an effective insulator to minimize evaporation loss. In many instances, and with fixed-top storage tanks in particular, heat input through the tank shell and other causes of vaporization permit profits to boil out into the atmosphere.

Additionally, the perlite concrete protects the metal tanks from rust and weather and is rot and vermin proof. As a result, annual tank maintenance costs are slashed. Furthermore, the white perlite concrete creates a highly-pleasing, textured, monolithic surface whose appearance is easy to keep up.

## Thin Stainless Steel Bars Hold Tunnel Duct Floor

The big new twin-tube expressway being laid beneath Baltimore Harbor has unseen stainless steel bars suspending the base or floor of the huge ventilating duct.

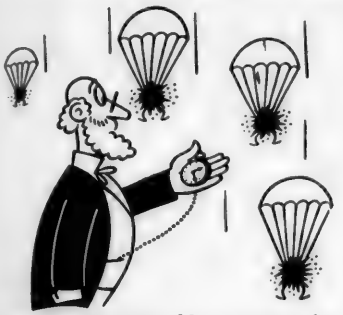


Fresh air enters the tubes below the roadways. Dangerous gases are eliminated by exhaust ducts that serve as the tunnel ceilings.

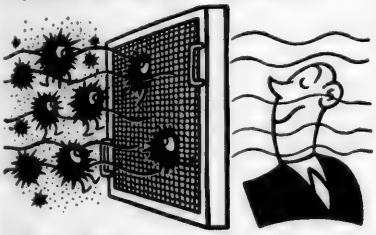
Armco Type 302 stainless steel bars are comparatively thin to cut down resistance to air flow, but possess the strength needed to hold up the tremendously heavy ceilings or duct floors. They also will resist corrosion from moisture and exhaust gases, an important consideration where replacements would be difficult and costly.

# AIR-MAZING FACTS

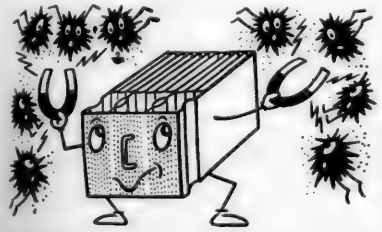
BY O. SOGLOW



**LOW-DOWN ON DUST!** Microscopic dust particles fall only 100 feet in 278 hours. During this time, a 10 mph wind would carry such dust particles all the way across the United States. Fortunately, you don't have to worry about dust, no matter where it comes from . . . if you use Air-Maze filters to remove harmful particles from air.



**BAD AIR GETS FRESH START!** Air-Maze air filters keep damaging dust and grit out of hotels, office buildings, stores—wherever clean air is required. Available in a large variety of types and sizes including unit panels, rotating curtains and self-washing electrostatic precipitators.



**MAGNETIC PERSONALITY!** More than 90% of all air-borne dust and pollen, even smoke particles, are drawn right out of the air by Electromaze electronic air filters. Used from coast to coast wherever super-clean air is desirable, Electromaze filters are more flexible in size, quicker to install and easier to clean.

**FOR AIR CONDITIONING AND VENTILATING EQUIPMENT, ENGINES, COMPRESSORS** *or any device using air or liquids*—there is an Air-Maze filter engineered to solve each filtering problem. For new all-line catalog, write Air-Maze Corporation, Dept. D-2, Cleveland 28, O.

**AIR-MAZE**

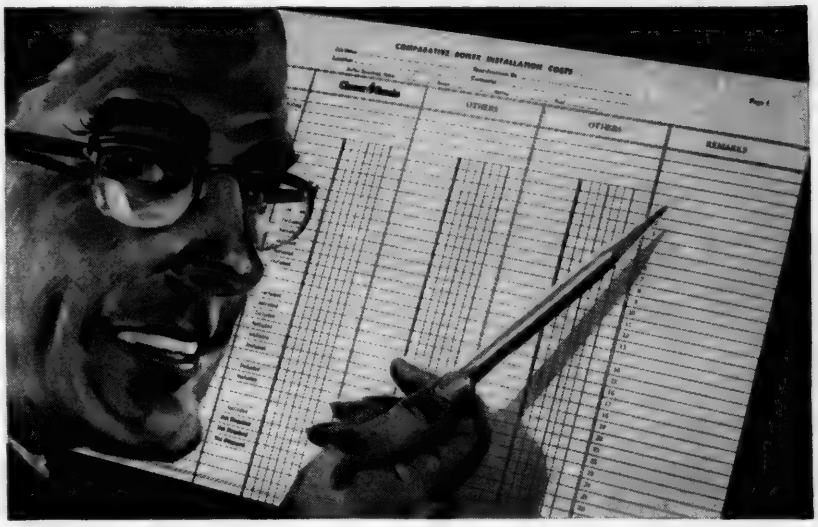
*The Filter Engineers*

AIR FILTERS • SPARK ARRESTERS • LIQUID FILTERS
SILENCERS • OIL SEPARATORS • GREASE FILTERS



## Before you buy any boiler

## compare quoted prices with REAL COSTS



## New Cleaver-Brooks cost analyzer clears "quotation" confusion — reveals ALL costs

Get *all* the costs . . . the *real* costs . . . down on paper before you recommend or specify a boiler to your clients. On many boiler installations "quoted prices" seldom agree with the total costs, as you may have learned. This is frequently the case with so-called "built-up" boilers assembled on the site.

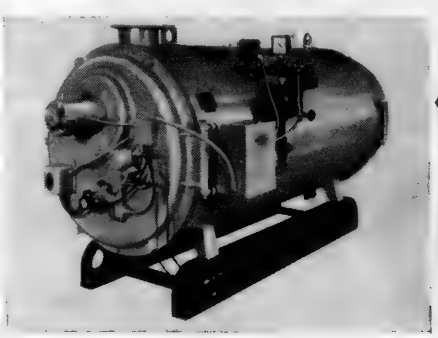
Cleaver-Brooks' cost analysis enables you to compare all material costs (boiler, steam trim, burner, refractory, controls and other equipment) and installation labor costs. You'll know the "real costs" on the complete installation before you start.

### Real eye-opener

The figures you'll see may be startling. In most cases the cost analysis proves a Cleaver-Brooks costs *less*. On-job time is drastically reduced because Cleaver-Brooks packaged units are fully assembled, ready to install. Cleaver-Brooks boilers give you more in performance, too . . . each boiler is fully fire-tested at the factory under load, tuned to peak economy. Starting service and on-the-job operator training by authorized field engineers further decreases your over-all costs.

### Contact your Cleaver-Brooks agent

Once you add up all the benefits of a Cleaver-Brooks "one-cost" package . . . the proved trouble-free economy of exclusive four-pass, forced-draft design, you'll find it pays over and over to analyze costs carefully before you buy. See your Cleaver-Brooks agent for details or write Cleaver-Brooks Company, 315 East Keefe Ave., Milwaukee 12, Wisconsin, Dept. L.



*Choose from 19 sizes, 130 models, 15 to 600 hp. Oil, gas and combination oil/gas fired — steam or hot water for heating or processing.*

Cleaver Brooks

ORIGINATORS OF SELF-CONTAINED BOILERS

# NEWS OF THE MONTH

## INNOVATIONS TO MARK ARI SHOW

**returning to Chicago for first time in 6 years; combined heating-cooling units to be exhibited.**

Return to Chicago as the site of the Air Conditioning & Refrigeration Exposition for the first time in six years will be marked by many innovations. Sponsored by the Air Conditioning & Refrigeration Institute, the show will be held at the International Amphitheatre, November 18 to 21, inclusive.

The exposition, the tenth to be held, will be the largest in its history. Over 250 companies will display and demonstrate products. Approximately 100,000 sq ft of exhibit space, exclusive of aisles and storage areas, will be used.

• **UNVEIL NEW EQUIPMENT**—Attendance at this year's show will be boosted by the fact that many of the 250 exhibitors are unveiling totally new lines of equipment, that heating equipment and combination heating-cooling units are being shown by many manufacturers for the first time, and that with heavier emphasis being placed on optimum efficiency for both heating and cooling systems, manufacturers of insulation products are planning displays and demonstrations of insulation designed to cut tomorrow's cooling and heating bills.

In addition to the completely new lines of room and central air-conditioners for 1958 and entirely redesigned heating plants and heating-cooling units, exhibitors have advised George E. Mills, show director, that they plan to show new packaged air-conditioners for widely flexible use in residential, commercial and industrial installations, new automatic ice making equipment and soft drink dispensers, walk-in refrigerators, completely new compressors and motors, large-capacity bulk milk cooling tanks for dairy farms, new copper-deck cooling towers and air-cooled condensers, truck refrigeration systems, new lines of home-freezers built entirely of aluminum, and many others.

In addition, the heat pump, a reverse-cycle air-conditioner which cools in summer and heats in winter, will be shown in widely diversified sizes—from room-unit size to installations capable of heating and cooling industrial plants and office buildings.

• **SIX SOCIETIES TO MEET**—Largely because of the many new exhibits planned for the November show, at least six industry associations and technical societies have scheduled meetings at Chicago on dates which will permit their members to visit the exposition. These include Air-Conditioning and Refrigeration Wholesalers, American Society of Refrigerating Engineers, National Commercial Refrigerator Sales Association, National Warm Air Heating and Air-Conditioning Association, Refrigeration and Air-Conditioning Contractors Association, and Refrigeration Service Engineers Society.

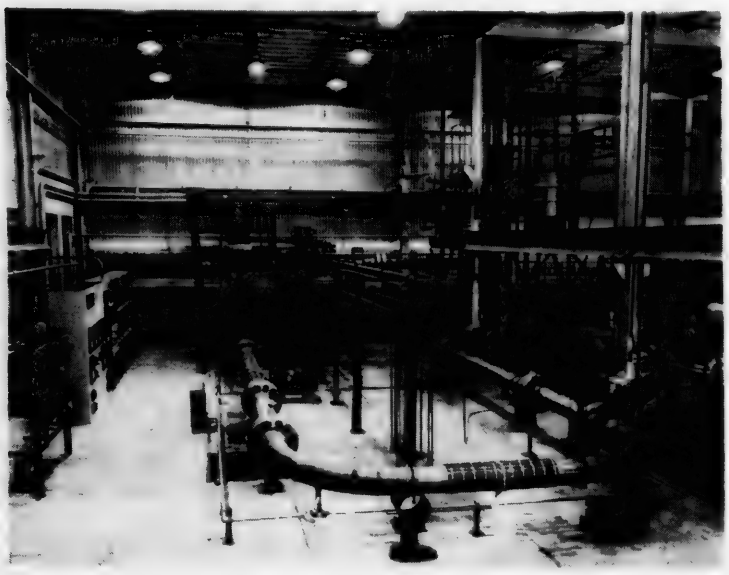
Full information on the show can be obtained by writing or wiring 10th Exposition of ARI, 1346 Connecticut Avenue, N.W., Washington 6, D.C.

## DEDICATION OF NEW I-B-R TEST LAB

**marks consolidation of hydronics industry. Will test check manufacturer's data before approval.**

Ceremonies were held on September 10 on the occasion of the formal opening of I-B-R's new Test Laboratory in Urbana, Ill. The check test center is designed and constructed for I-B-R-rated baseboard and commercial finned

*(Continued on page 158)*

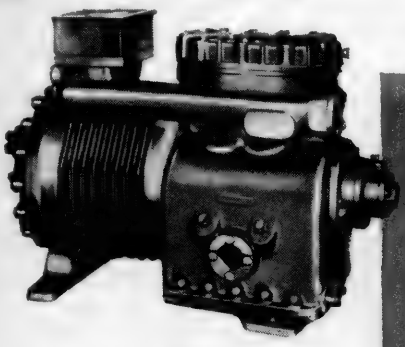


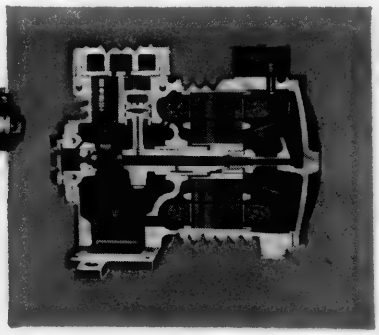
## SLURRY TEST LOOP

Under construction at the atomic power department of the Westinghouse Electric Corporation, this test loop will be used to simulate slurry flow conditions for the Pennsylvania Advanced Reactor Project (PAR).

When completed, the loop will circulate slurry at PAR reactor pressures, temperatures and concentrations, at a flow rate of 4000 gpm, half the flow rate required in each of the four loops of the ultimate plant.

The project is a major development jointly sponsored by Westinghouse and Pennsylvania Power and Light Company. Its function is to carry out the experimental and analytical studies leading to the design of an aqueous homogeneous reactor plant having an electrical output of 150,000 kw. This plant is to operate on the PP&L system in Eastern Pennsylvania.





# COPELAMETIC

THE *Accessible* HERMETIC

**You can get to direct-drive Copelametic units effortlessly...in a jiffy. No belts or seals, no manual oiling. 90% of service costs eliminated. Models for all applications—air-cooled—from ⅓ through 5 H.P. Water-cooled ⅓ H. P. through 10 H.P.**

# the easy way to solve a tough problem

So you have a reputation to maintain for high-quality installations in the air-conditioning and refrigeration fields.

And you have worries. You must meet and beat competition. The quality and performance of what you get from your suppliers are a constant concern.

That's the perfect time to make sure there's a Copeland motor-compressor or condensing unit in every piece of equipment you install. For Copeland units are masterfully designed, painstakingly built, are standard with leading manufacturers. Now they're streaming from our spanking-new plant—270,000 square feet of America's most modern manufacturing facilities.

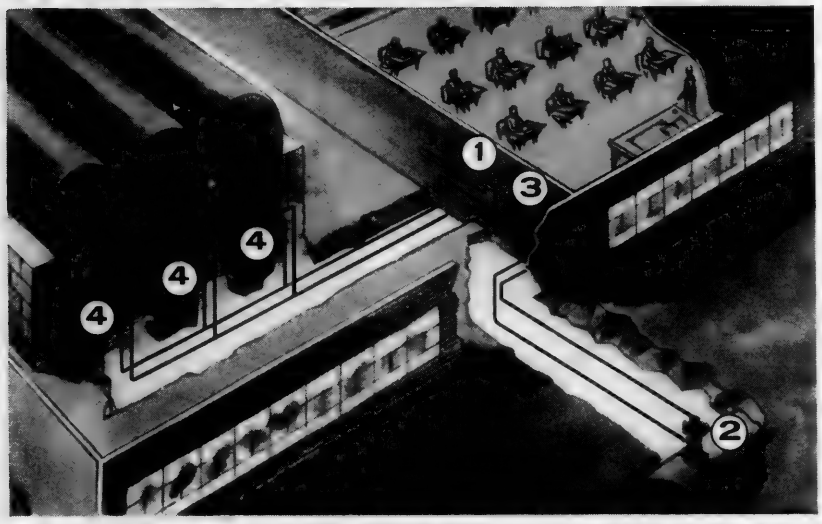
LIVE BETTER ELECTRICALLY

SINCE 1918

*MANUFACTURERS OF THE HEART OF AMERICA'S FINEST AIR CONDITIONING AND COMMERCIAL REFRIGERATION UNITS*

**Copeland REFRIGERATION CORPORATION, Sidney, Ohio**

## New Thermal Electric® System solves heavy fuel oil handling problems




## GUARANTEED PERFORMANCE

*Thermal Electric System is guaranteed by Fluid Systems, Inc.:*

- *To remove No. 5 or No. 6 fuel oil from storage without auxiliary heat in storage.*
- *To deliver the fuel oil to the connection provided by the manufacturer of each burner or boiler-burner unit, at not less than 120 degrees Fahrenheit under all conditions of flow, non-flow, intermittency of flow or rate of flow.*
- *After extended shutdown of pipe heating, to raise pipe and contents to design temperature.*

Thermal Electric takes the guesswork out of pre-heating and handling heavy oil. Fuel viscosity becomes a known, reliable factor since temperature is strictly controlled and hydraulics are predictable. In this pre-engineered system, controlled increments of 60 cycle, low voltage alternating current convert the pipe carrying No. 5 or No. 6 oil into a continuous low density heating element which maintains correct temperature level . . . even during long shutdown periods. Power consumption? For the average two-burner installation, the same as three or four 100-watt bulbs.

**1.** During burner operation, the excess return oil from the burner is sent through the Thermal Electric Immersion Heater. **2.** In the Thermal Electric Tank Unit the warm return oil (170°-200°F.) is mixed with cold oil from storage (50°-60°F.) to produce 120°F. suction line temperature. **3.** The Thermal Electric Energizer, connected directly to the oil lines, provides controlled increments of low voltage 60 cycle alternating current which maintains the oil at 120°F. (300 SSF.) from the tank to the burners. **4.** Even after prolonged shutdown, the oil at the burners is always at the correct temperature for a clean and safe automatic start-up.

*More detailed information is contained in our new 20-page handbook. Also available is UL report MP 2047. Send for your free copy today.*

**FLUID SYSTEMS, INC.**
**1881 DIXWELL AVENUE**
**NEW HAVEN 14, CONNECTICUT**
Gentlemen:
I'd like more information.
☐ 20-page handbook on Thermal Electric
☐ Underwriters' Laboratories Report MP 2047
☐ Have your representative call.

**NAME** ..... **TITLE** .....
**COMPANY** .....
**ADDRESS** .....
**CITY** ..... **ZONE** ..... **STATE** .....

Fluid Systems INC.

Trademarks Reg. U.S. Pat. Off.


# NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**COMBUSTION EFFICIENCY CALCULATOR**— A combustion efficiency chart, actually a slide-rule calculator offered by F. W. Dwyer Mfg. Co., Michigan City, Ind., will give the overall efficiency of a furnace or boiler with one simple setting. In addition, the calculator demonstrates visual proof of combustion efficiency, eliminates guesswork, and reduces costly callbacks for the heating serviceman.

Circle **Item 64** on Inquiry Card

**SUBMERSIBLE PUMPS** — Bulletin No. 6700-E from The Deming Company, Salem, Ohio, describes the firm's line of submersible pumps and water systems. The bulletin includes selection tables for wells up to 480-ft deep, with minimum diameter of 4 inches. It also describes construction features and lists auxiliary fittings and equipment.

Circle **Item 65** on Inquiry Card

**MULTIZONE CENTRAL SYSTEMS** — The 9 models and 32 different arrangements that are standards in the company's line of multizone-type central plant air conditioning systems (trade-named Flexazone) are subject of new data-filled brochure from Drayer-Hanson, Div. of National-U. S. Radiator Corp., Los Angeles, Calif. Piece is of interest to those concerned with selection of equipment for heating, cooling, or ventilating of large-space areas, with units designed to give independent, or variable control in almost any type construction, new or existing.

Circle **Item 66** on Inquiry Card

**PACKLESS EXPANSION JOINTS** — Available from Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn., is a 4-page bulletin No. SF-748, describing three models in the company's line of packless expanion joints. Included are specifications and expansion capacity of the models.

Circle **Item 67** on Inquiry Card

**PACKAGED AUTOMATIC BOILERS** — A four-page, illustrated bulletin, No. 1243, describing Power-Pak packaged automatic boilers for steam or hot water heating and hot water service, is available from Orr & Sembower, Inc., Reading, Pa. The boilers are available in the 15 to 25-hp range for pressures up to 15 psi. It is integrally equipped with either oil or gas firing burners, all completely designed, constructed, fire-tested, insulated, and guaranteed by the manufacturer.

Circle **Item 68** on Inquiry Card

*(Continued on page 144)*

# Blend It...
# Hide It...
# Combine It...

Installed as a continuous strip in window head or sill (as above), AGITAIR STRIPLINE is the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill.

AGITAIR®

STRIPLINE

DIFFUSERS

**BLEND IT . . .** specify AGITAIR STRIPLINE as a continuous decorative unit, or in sections to meet any requirements of interior treatment.

**HIDE IT . . .** in shallow lighting coves for perfect concealment.

**COMBINE IT . . .** with unit or continuous lighting fixtures.

**AND REMEMBER . . .** no matter how you use it — AGITAIR STRIPLINE diffusing vanes create maximum mixing and aspiration . . . quick temperature equalization . . . and correct air distribution over any desired length.

*Every Inch a Diffuser . . . the Vanes Make the Difference*

**AIR DEVICES INC.**

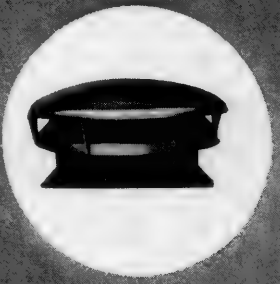
185 MADISON AVENUE, NEW YORK 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS



# ACCEPTED Allen ROOF VENTILATION

Whatever your ventilating needs, be sure to see how Allen equipment can meet your requirements efficiently and economically.



**NEW "I-LINE" for EYE APPEAL**

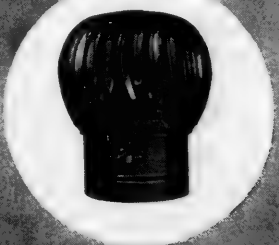
The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.

**POWERFUL "VD" for HIGH VELOCITY**

By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.

Allen

. . . is prepared to investigate ventilating problems and plan systems for the efficient removal of heat, fumes, vapor or dust.



**WIND-DRIVEN TURBINES**

Three types of Allen turbines take full advantage of the economy of natural air movement.

**EXHAUST FANS**

Remote drive Staxauster is designed to handle corrosive fumes, and/or high temperature air.

**THE ALLEN LINE**

Write today for catalog that gives specifications and performance data on these and other units in the Allen ventilator line.

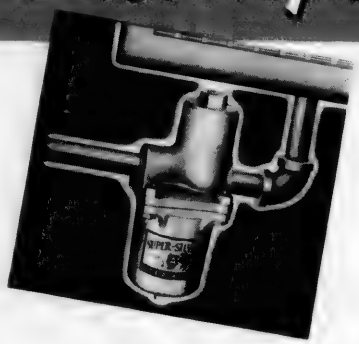
ALLEN

ALLEN COOLER & VENTILATOR, INC.
ROCHESTER, MICH.

*Roof Ventilators for Every Commercial and Industrial Need*

REPRESENTATIVES IN PRINCIPAL CITIES

If you were plagued last winter by calls to "turn up the heat" in your plant, it's time to plan ahead for this year's icy temperatures. Super-Silvertop Steam Traps can increase the efficiency of your steam heating system, and save hundreds of dollars in fuel bills. Whatever type of steam system you have, unit heater, pipe coil, fan system, or any other, you'll find Super-Silvertops will vent the air and drain condensation rapidly, allowing the heater to reach full operating efficiency almost instantly.



Make your steam heating system give you your money's worth. Replace your obsolete traps with Super-Silvertops. Reduce corrosion, get faster heat, save on fuel bills, and enjoy a warm, comfortable plant the year 'round with Anderson Super-Silvertop Steam Traps. See your jobber or Anderson Sales agent today!

ANDERSON
SUPER-SILVERTOP STEAM TRAPS
the Engineered Steam Trap!

THE NEW WAY
Notice the simplicity and savings in fittings.

THE OLD WAY
Notice how bottom inlet requires complicated piping.

**Free Trap Selector Booklet!**

Tells how to select and install traps for all steam equipment. For your free copy, fill out and mail this coupon to:

THE V. D. ANDERSON COMPANY
division of International Basic Economy Corp.
1973 West 96th Street, Cleveland 2, Ohio

Name_____
Company_____
Address_____
City_____ Zone____ State_____


## NEW CATALOGS

*(Continued from page 142)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**STEAM BOILER SAFETY CONTROLS**— A 24-page book published by McDonnell & Miller, Inc., Chicago, Ill., covers basic safety controls for all low pressure steam boilers. It is a companion-piece to a previously issued booklet covering safety controls for hot water space heating boilers. The new book tells the story in simple diagrams and explanation; wastes no words on product description; adheres to the "why" and "how" of all authoritative methods of providing maximum safety and automatic water level control for all low pressure steam boilers.

Circle **Item 69** on Inquiry Card

**VALVES AND PIPING**— A valve catalog, No. 57, covering the company's complete line of bronze and iron body valves, has been published by The Fairbanks Company, New York, N. Y. The profusely illustrated, 136-page, hard cover catalog also includes helpful technical data for the initial design of piping layouts in the Useful Information section. These data include a table of equivalent resistance of valves, fittings, and bends; and charts for the rational solution of pressure drop for liquids, gases, and steam. The use of these data permits rapid appraisal of the pipe sizes required for the particular flow requirements in various systems.

Circle **Item 70** on Inquiry Card

**AIR DISTRIBUTION AND CONTROL**— A four-page illustrated bulletin, No. F-8326, presents a new concept in air conditioning comfort developed by Barber-Colman Co., Rockford, Ill. It discusses the combined application of Electronic temperature controls and Uni-Flo air distribution products. By closely co-ordinating the functions of these two products, the company has developed a system that assures the proper relationship of air velocities and temperatures, thus producing constant uniform comfort from any type of air conditioning system.

Circle **Item 71** on Inquiry Card

**UNIT HEATERS** — A booklet, B-1523, describing the company's new line of commercial and industrial unit heaters, is available from Westinghouse Sturtevant Div., Hyde Park, Boston, Mass. Containing many illustrations and tables, the 26-page booklet describes in detail the construction and application of the units.

Circle **Item 72** on Inquiry Card

*(Continued on page 146)*

# Rx for the new home of Ethicon...

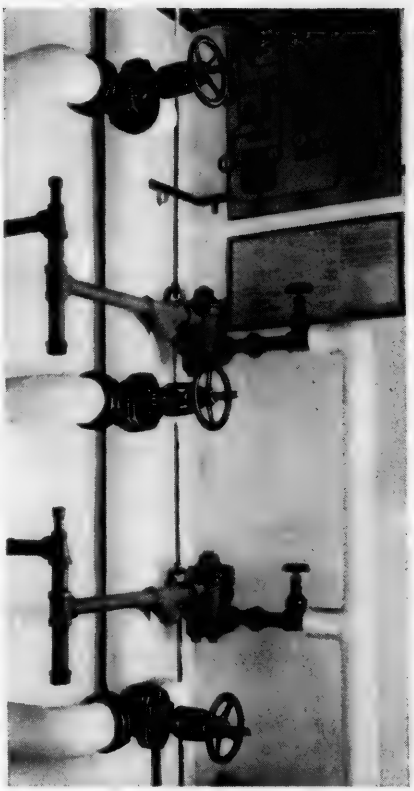
## where dependable control of processes is essential – JENKINS VALVES

In modern architectural plant design as in product development and improvement, ETHICON, INC., a subsidiary of Johnson & Johnson, is "Setting New Standards". Its new home office and main finishing plant in Somerville, N. J. embodies the most modern equipment and facilities for the manufacture of surgical sutures and allied products for the medical profession.

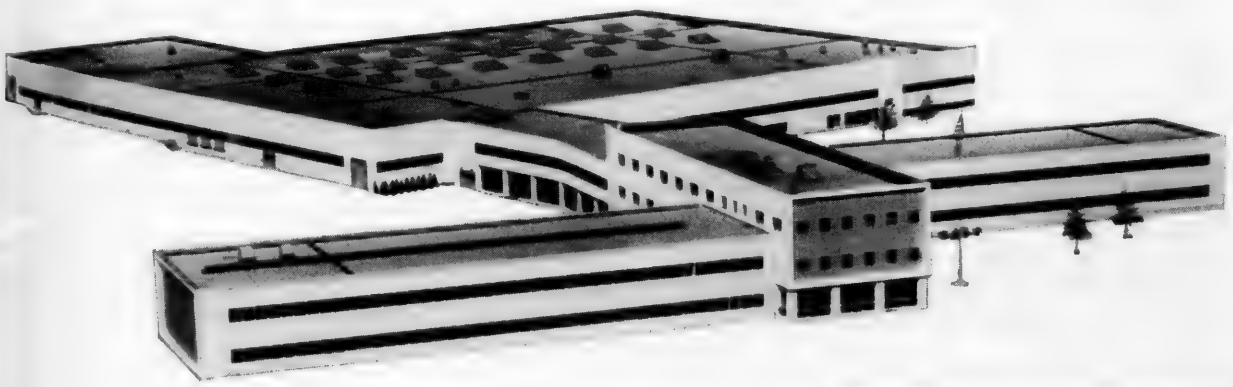
Manufacture of such products obviously demands absolute control over processing. To meet these critical requirements, equipment had to be selected with extreme care. For dependable control of pipelines which supply essential steam, water, air-conditioning, and other services, Jenkins Valves were prescribed.

This confidence in the extra measure of efficiency and reliability of Jenkins Valves has shown up in the specifications of important plants and buildings for nearly a century. It is symbolized by the Jenkins Diamond and Signature trade-mark. The valves that bear this famous mark cost no more.

Jenkins Bros., 100 Park Ave., New York 17.



Jenkins Fig. 651-A iron body gate valves and Fig. 370 bronze gate valves on the air conditioning system.



*Architects:* SERGE P. PETROFF & ASSOCIATES
*Mechanical Engineer:* MUZZILLO & TIZIAN
*Construction Engineer:* NORMAN W. KEMPSON
*Mechanical Contractor:* RICHARDSON ENGINEERING COMPANY
*General Contractor:* JOHN W. RYAN CONSTRUCTION CO., INC.

JENKINS VALVES
LOOK FOR THE JENKINS DIAMOND
JENKINS SINCE 1864
Jenkins Bros.

Sold Through Leading Distributors Everywhere

# HERE'S EXTRA PROTECTION

## against pump shaft leakage

*Single-stage, double suction DMV-DHV general hydraulic pumps are available for heads to 350 ft., capacities from 275 to 2400 gpm.*

*Use of double mechanical shaft seals in*

## DMV-DHV PUMP LINE

*ends stuffing box maintenance*

This modern DMV-DHV pump *is different!* Gone are the conventional packed stuffing boxes—with their periodic tightening, repacking, and annoying shaft leakage.

Double Mechanical Shaft Seals are standard equipment. Self-adjusting, they require no attention throughout their entire service life. Leakage is effectively prevented.

**NO BEARING LUBRICATION**

Another advanced design feature of the DMV-DHV pump that helps eliminate maintenance problems is the use of Cartridge-Type Bearings. The lubricant is permanently sealed in. This means successful operation for many years —in tough installations—without any servicing.

*Greater Compactness* is obtained with this modern construction using mechanical shaft seals and sealed bearings.

Contact your nearest I-R branch office for full details. Or write for Bulletin 7248-A.

**Ingersoll-Rand**

10-289 Cameron Pump Division
11 Broadway, New York 4, N. Y.

PUMPS • CONDENSERS • TURBO-BLOWERS • COMPRESSORS • ROCK DRILLS
DIESEL & GAS ENGINES • AIR & ELECTRIC TOOLS


# NEW CATALOGS

*(Continued from page 144)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**STOKERS, CONTROLS, CONVEYORS**— An illustrated, 6-page folder offered by The Will-Burt Company, Orrville, Ohio, covers the wide range of the company's automatic air-controlled hopper and bin-feed model stokers for institutional, commercial, and industrial buildings. A section is devoted to the company's panel controls for stoker programming. Featured also is a newly developed, low-cost, enclosed coal conveyor that reverses electrically to reject obstructions or jammed coal. Complete dimension and capacity tables, plus drawings especially prepared to aid in detailing stoker installations, are included.

Circle **Item 73** on Inquiry Card

**FLEXIBLE AIR DUCT** — The flexibility and versatility of the company's flexible air duct, Type 57-1A, for conducting hot and cold air in high and low-velocity air conditioning systems is demonstrated in a new data sheet, No. S-11, available from The Wiremold Co., Hartford, Conn. The data sheet illustrates three different air conditioning problems which were solved through the use of this type of air duct.

Circle **Item 74** on Inquiry Card

**LIQUID METER, CONTROLLER** — Veriflow meters which indicate and totalize liquids, including water and fuel oil, using positive displacement principle are manufactured by The Hays Corporation, Michigan City, Ind. Principle, construction, operation, and features of both the meter and Veritrol controller are explained in an eight-page illustrated color catalog, Publication 54-766-38.

Circle **Item 75** on Inquiry Card

**COOLING WATER TREATMENT** — Betz Laboratories, Inc., Philadelphia, Pa., announces publication of Technical Paper No. 137, entitled, A Case History in Cooling Water Treatment. The problems of corrosion and tower wood deterioration are commonly encountered in recirculation cooling water systems. At the Delhi Natural Gasoline Plant in Louisiana, the concurrent presence of these two problems resulted in plugging of heat exchanger tubes and in high metal loss throughout the system. A program of treating the water was undertaken both to minimize the attack of the wood and to prevent corrosion. Effectiveness of the treating program was followed by corrosion studies to evaluate the benefits of each step taken.

Circle **Item 76** on Inquiry Card

*(Continued on page 148)*

# How Hartzell Duct Fans Help Cut Ventilating Costs

## Lower Equipment Cost

Hartzell fans are competitively priced . . . yet they're designed and built for maximum reliability and long life. When you compare prices, estimate the service life of each make and rank them on the basis of cost per year of useful life. On that basis, Hartzell fans will always be by far your best buy.

## Lower Installation Costs

Hartzell duct fans are much easier to install than many other types of ventilating equipment which might be used to do the same air-moving job. Each fan is a completely pre-fabricated duct section. To install a Hartzell duct fan you need only cut a section of duct work the same length as the fan, bolt angle iron flanges to the duct ends and bolt the fan to the flanges. After that, just install bracing and make electrical connections and you're done. Easy installation means fast installation . . . and real savings on costly labor charges.

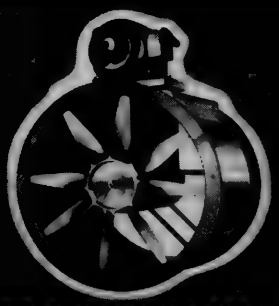
## Lower Maintenance Costs

Hartzell duct fans require practically no maintenance. Their rugged construction and the high standards of quality in workmanship and materials to which they must conform practically eliminate failures under normal operating conditions. Routine maintenance requires nothing more than periodic lubrication and occasional replacement of belts. Motors on direct-drive models and bearings on belt-drive models are Alemite-lubricated from outside the duct. Belt changes or adjustments on belt-drive models are also conveniently made from outside the duct. Hartzell design and construction holds maintenance to a minimum . . . and that's a vital consideration under today's wage scales.

**For complete details on Hartzell duct fans and how they can help you cut your air-moving costs, just call your nearby Hartzell field engineer. If you don't know him, just drop us a line for his name and address. And be sure to ask for Bulletin A-109.**

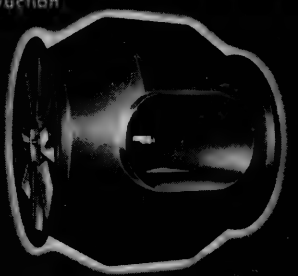
**Why You Can Count on Hartzell Air-Moving Equipment for Long Life, Rugged Reliability and Minimum Maintenance**

Hartzell fans and blowers are engineered and built for the exacting requirements of tough industrial service. There's no compromise with quality for the sake of shaving a few dollars on price. Hartzell fans are designed for the industrial buyer who is willing to pay for long life, dependable service and low maintenance.



**BELT DRIVE DUCT FAN**

These fans are the best choice for most installations where air (including that containing fumes, corrosive elements or dust) must be moved through a duct. Fourteen sizes, 12" to 60" fan diameters; single-propeller, two-propeller or multi-blade models, in belt-drive or direct-drive construction.



**BI-PASS DUCT FAN**

This special model, with motor mounted in a tunnel completely out of the air stream, is designed for moving corrosive fumes and air at temperatures as high as 550° F. Six sizes, 19" to 41".

**REVERSIBLE DUCT FAN**

This fan moves air in either direction with equal efficiency and can be supplied with controls for manual or automatic reversal. It is useful in many ventilating applications as well as in cooling and drying processes. Four sizes, 18" to 44".

**HARTZELL**
**PROPELLER FAN CO.**
Div. of Castle Hills Corp.

**303 Thomas Blvd. • Piqua, Ohio**

*ENGINEERING OFFICES IN PRINCIPAL CITIES*

# HOW TO SOLVE THE 3 BIG PROBLEMS of Heating System Design

## KEEP COSTS DOWN

The cost of Reznor unit heaters is comparable to or lower than that of other types of equipment of equal heating capacity. And with Reznor, this is the total cost. You don't have to add the costs of extensive piping and valves or duct work, and of radiators or registers. Reznor gas unit heaters produce and distribute heat at the point of need. To install them involves only suspension, venting and utility connections. So installation costs are much lower than those of central heating systems. Lower equipment cost . . . lower installation cost . . . two reasons why Reznor gas unit heaters can offer substantial savings on heating systems for so many commercial and industrial buildings.

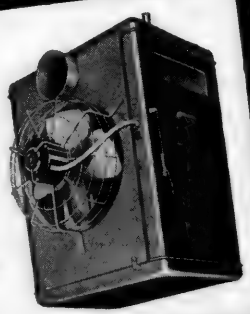
## SAVE SPACE

Reznor gas unit heaters are installed up at the ceiling, completely out of the way. When you design for a store or factory, you don't have to allot a single square foot of valuable space for heating equipment . . . and you don't have to keep floor or wall areas clear for radiators or registers.

## INSURE FLEXIBILITY

When you specify Reznor gas unit heaters you don't have to choose between a heating plant which is over-sized and over-priced for current requirements and one which may not be adequate for future needs. With Reznor unit heating, when that new wing is added, additional heaters are installed. It's as simple as that. And in the case of internal remodeling, it's very easy and inexpensive to relocate the existing heaters.

## ONLY REZNOR GAS UNIT HEATERS OFFER ALL THESE ADVANTAGES



- Clean, modern design, back as well as front . . . all controls and connections inside the cabinet.
- FlexiTemp control system with automatic two-speed fan control to provide nearly continuous air circulation and minimize temperature fluctuations (optional).
- No costly frills and gadgets . . . features which are needed only to meet special situations always separately listed and priced.
- Fan or blower models in ten sizes from 25 to 300 thousand BTU.

There is no "equivalent" for Reznor gas unit heaters.

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED UNIT HEATERS
Reznor Manufacturing Company
64 Union St., Mercer, Pennsylvania

for complete details, wherever you are . . .

Look for Reznor under "Heaters-Unit" in the Yellow Pages


# NEW CATALOGS

*(Continued from page 146)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**SOLENOID VALVES**—A solenoid valve catalog, No. 30-10, is available from Sporlan Valve Co., St. Louis, Mo. Printed in two colors, the catalog is attractively bound, and punched so that it may be used as a separate catalog or filed as a section of the company's general sales manual. The brochure is divided into six sections dealing with general information, capacities, specifications, installation and service, special applications, and the solenoid pilot control.

Circle **Item 77** on Inquiry Card

**SYSTEM IDENTIFICATION MARKERS**—To help engineering and plant maintenance departments in permanently identifying fuel systems, piping, ducts, conduits, and other systems, Westline Products Div., Western Lithograph Co., Los Angeles, Calif., has available a complete catalog outlining printed industrial markers with legends and codes that give positive identification for the above systems. Tel-A-Pipe self-adhering markers are furnished on easily handled dispenser cards for instant application.

Circle **Item 78** on Inquiry Card

**STEAM, HOT WATER SPECIALTIES** — A 48-page catalog, No. G-357, published by Hoffman Specialty Mfg. Corp., Indianapolis, Ind., illustrates and describes the company's line of steam and hot water heating specialties. Included are baseboard and commercial radiation, condensation pumps, valves and regulators, traps, and zone controls.

Circle **Item 79** on Inquiry Card

**TURBINE VENTILATOR** — A catalog from Greenheck Fan & Ventilator Corp., Schofield, Wis., describes the company's Centriflo turbine ventilator. Catalog contains complete specifications illustrated with sketches showing bearing assembly, rotor blades, rotor ring, suspension assembly, and lower radial guide. Included is detailed dimension drawing.

Circle **Item 80** on Inquiry Card

**REFRIGERATION EQUIPMENT**—A brochure, entitled Wolverine Serves the Refrigeration Industry, is released by Wolverine Tube, Division of Calumet & Hecla, Inc., Detroit, Mich. It highlights company facilities, engineering capabilities and diversification, and how it all leads to a quality product. Complete range of the company's product line for the industry is shown.

Circle **Item 81** on Inquiry Card

*(Continued on page 150)*

We'll be there . . . at the 10th Exposition of Air Conditioning and Refrigeration

**Booth No. 201**

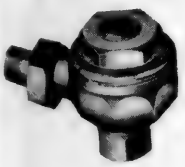
International Amphitheater • Chicago
November 18-21, 1957

. . . AND we'll provide FREE BUS SERVICE to and from the show at

HOTEL SHERMAN • MORRISON HOTEL
PALMER HOUSE • CONRAD HILTON

***Be our guest!***

# What a big difference a trap can make!



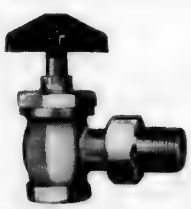
Angle

Straightway

Vertical

Left hand corner

Right hand corner



Marsh Packless Radiator Valves are perfect team mates for Marsh Radiator Traps. The metal-to-metal seal places them in a class all their own.

Yes, the success or failure of a steam distribution system can hinge on things as small as radiator traps. That's why it pays to use Marsh Radiator Traps—traps that are individually and permanently adjusted to close tight on steam, but open promptly and pass air or condensate at temperatures only a few degrees below closing temperature.

The part that provides positive operation in Marsh Radiator Traps is that rugged-but-sensitive thermostatic diaphragm. After this element has been assembled it is made completely seamless by a heavy overall deposit of copper. It is then filled with an accurately measured charge of volatile fluid; finally tested by expert operators to make sure that its expansion and contraction is exactly right to produce the utmost efficiency and economy.

Construction throughout is in keeping with the effective diaphragm. Bodies are of extra heavy cast brass suitable for pressures up to 125 lbs. steam. Bonnet assemblies of a given type and size are interchangeable. Trap seats are renewable. All components are made with a large safety factor beyond rated operating pressures.

Next time make it Marsh throughout and see the difference . . . Marsh traps, packless valves, bucket traps, venting valves. All are covered in the new fact-filled catalog.

**MARSH INSTRUMENT CO.** *Sales Affiliate of Jas. P. Marsh Corporation* **Dept. U, Skokie, Ill.**
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta

# MARSH

*Heating Specialties* **SINCE 1865**

# FAIRBANKS

**UNION BONNET GATE VALVES**

125 lb.

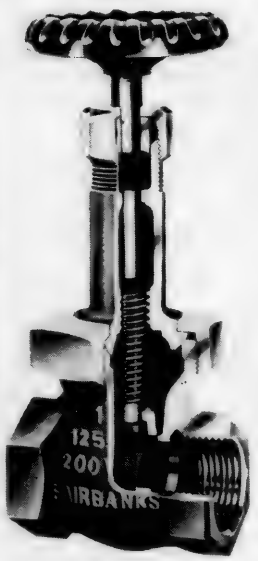



**FIGURE U-0252** | Rising Stem. Solid Wedge. Taper Seat. 125 Pounds Steam Working Pressure. 200 Pounds Cold Water, Oil or Gas Pressure. Non-Shock.

150 lb.

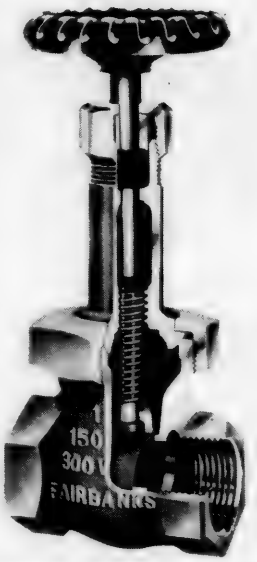



**FIGURE U-0226** | Rising Stem. Solid Wedge. Taper Seat. 150 Pounds Steam Working Pressure. 300 Pounds Cold Water, Oil or Gas Pressure. Non-Shock.

**Two-Piece Union Bonnet Construction For Extra Easy Assembly And Disassembly**

Two-piece **Radial Seat** Union Bonnet Construction provides extra easy assembly, long service, dependability that gives you extra value. **Radial Seat** provides line contact through accurately machined true ball and socket mating surfaces, for leakproof body bonnet joint. Two-piece construction eliminates sliding or scraping — prevents scoring — of body and bonnet mating surfaces during assembly and insures even contact pressure for perfect alignment of working parts. Heavy union nut will not deform under pressure and protects body and bonnet from distortion. Valves may be repacked under pressure when wide open—top seat above threads—out of line of flow—is protected against deposits and excessive wear.

**SERVICE:** Recommended for general service on steam, water, gas, and oil lines where full, unrestricted flow is desired. Valves give long trouble-free operation.

**YOURS ON REQUEST:** Colorful, illustrated brochure fully describes Fairbanks Bronze Gate Valves with Union Bonnet Construction, complete with specifications and details. Write for your free copy today.

**Order Fairbanks products through your local distributor who is always happy to serve you.**

THE **Fairbanks** COMPANY

393 LAFAYETTE STREET, NEW YORK 3, NEW YORK

BRANCHES: NEW YORK 3 • BOSTON 10

PITTSBURGH 22 • ROME, GEORGIA

Trucks • Valves • Casters • Wheels • Dart & "Pic" Unions


## NEW CATALOGS

*(Continued from page 148)*

**Use the prepaid postcard on last page for securing your copies of catalogs described in this department.**

**WELDING TECHNIQUES** — A 32-page special Construction Maintenance Issue of the semi-monthly Technical Information Digest (TIS 2832) is available from Technical Information Service of Eutectic Welding Alloys Corp., Flushing, N. Y. Devoted entirely to industry's construction maintenance problems, this issue is designed to give contractors and their welding maintenance staffs practical weld savings case histories replete with almost 90 illustrations of the methods utilized.

Circle **Item 82** on Inquiry Card

**DIRECT DRIVE ROOF VENTILATOR** — Bulletin SDA-220 from Fan and Blower Div., The Peerless Electric Co., Warren, Ohio, has recently been revised to include the company's new direct drive centrifugal roof ventilator and new belt drive sizes up to 60-inch dia wheels. The revised bulletin contains features, construction details, ratings, performance data, and dimensions on both the belt drive and direct drive roof ventilators. Recommended specifications are also discussed in the bulletin.

Circle **Item 83** on Inquiry Card

**PLUG VALVE LUBRICANTS**—A 12-page illustrated lubricating manual for lubricated plug valves is issued by Walworth Company, New York, N. Y. The manual describes the function of lubricants in lubricated plug valves and the essential properties of an effective lubricant. Detailed information on how to select the right lubricant and how to apply it is presented in text and pictures.

Circle **Item 84** on Inquiry Card

**ROTARY MASONRY DRILLS**—Available from Termite Drills, Inc., Pasadena, Calif., is a folder describing the company's complete line of rotary masonry drills. Included in information are styles and fields of application, specifications, and prices.

Circle **Item 85** on Inquiry Card

**FLUID CONTROL VALVES** — Available from Schade Valve Manufacturing Co., Philadelphia, Pa., is Catalog No. 307 describing the company's Series 30 fluid control valves. These valves feature a combination of good balance and accuracy of control along with single-seated tight closing construction. Specifications and valve sizing information are included in catalog.

Circle **Item 86** on Inquiry Card

*(Continued on page 152)*

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY

OPEN TYPE DP (Doubly Protected) MOTOR. Dripproof, corrosion-resistant. 1 through 30 horsepower. Other models available in ratings through 500 hp.

TOTALLY-ENCLOSED, FAN-COOLED TYPE EP MOTOR. Fully protected construction. TYPE JP is explosion proof. 1 through 30 horsepower. Other models are available in ratings through 250 hp.

## OPEN TYPE OR TOTALLY ENCLOSED MOTORS...

# Wagner offers MORE for your motor dollar!

- **MORE POWER IN LESS SPACE** . . . These motors are built in NEMA frame sizes 182 through 326 U. They pack more power into less space for easier handling and stocking—require less space for installations.
- **CORROSION-RESISTANT FRAMES** . . . Both types are built with rugged, corrosion-resistant cast iron frames. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.
- **THE TYPE OF PROTECTION YOU NEED** . . . Type DP motors have completely dripproof—virtually splash-proof enclosures; while type EP is totally enclosed, fan-cooled for complete protection; and type JP adds explosion proof features.
- **COOLER OPERATION** . . . Special baffles direct a cooling flow of air through the DP motor. Types EP and JP are fan-cooled and have ribbed frames to increase the surface area for more efficient cooling.
- **LONGER BEARING LIFE** . . . These motors can be re-greased when desired to prolong bearing life. Fresh grease can be added—old grease removed through openings provided in the bearing housing.
- **WAGNER DEPENDABILITY** . . . These two motors have the same high Wagner quality, will give the same long life performance, that have made Wagner Motors a *known* value for sixty-five years.
- Let a Wagner field engineer, expert on motor applications, show you how these motors can be applied to your needs. Call the nearest of our 32 branch offices, or write us. Bulletins MU-202 and MU-203 give complete information on these Wagner Motors. Write for your file copies today.

M57-A

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

VISIT US AT BOOTH 672-10TH EXPOSITION, AIR CONDITIONING AND REFRIGERATION INDUSTRY.

AirMpeler

LO-BOY
CENTRIFUGAL
ROOF EXHAUSTERS

*Enhance The Beauty Of Building Skylines*

Pats. Pend.

**Lowest Silhouette Design**

**FORWARD OR BACKWARD CURVE WHEEL WITHIN . . . . OR OUT OF SCROLL HOUSING**

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

**LOW WIND RESISTANCE**
**SIZES 10"-72" 600-47,000**
**CERTIFIED C.F.M. RATINGS**

- **QUALITY**
- **BEAUTY**
- **PROVEN PERFORMANCE**

***See Sweet's File 20c/Amm or Write for bulletin AC100-57***

**AMMERMAN CO., INC.**
**109 North Second St.**
**Minneapolis 1, Minnesota**
**MEMBER OF THE AIR MOVING & CONDITIONING ASSN.**

# NEW CATALOGS

*(Continued from page 150)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**WET-COLLECTOR WATER TREATMENT** Hard deposits, congestion, and corrosion greatly decrease the efficiency of wet-type dust collectors and necessitate frequent clean-cuts. Bulletin WDC from The North American Mogul Products Co., Cleveland, Ohio, shows how proper water treatment will greatly reduce these troublemakers and promote peak efficiency. Case histories show how six manufacturing plants cut clean-out time and protected their equipment at low cost.

Circle **Item 87** on Inquiry Card

**AIR-COOLED CONDENSERS**—A bulletin on air-cooled condensers for remote installations has been issued by Halstead & Mitchell, Pittsburgh, Pa. The bulletin, AC-101, describes several different methods of operating air-cooled condensers at low ambient (winter) temperatures and gives advantages of each. Included is a description of the Limitrol system, using the modulating valve to automatically maintain balance between condenser and compressor under all kinds of weather conditions.

Circle **Item 88** on Inquiry Card

**OIL BURNER PRIMARY CONTROL** — Of special interest to both oil burner manufacturers and dealers will be the newly released brochure on PerfXray, the only burner-mounted primary control, available from General Controls Co., Glendale, Calif. A complete outline of the many advantages of the control plus informative and appropriate wiring diagrams are provided.

Circle **Item 89** on Inquiry Card

**COMMERCIAL PLUMBING FIXTURES**— Plumbing fixtures for schools, public buildings, factories, office buildings, and other commercial installations is the subject of a 4-page, illustrated folder, No. 57, released by Universal-Rundle Corp., New Castle, Pa. Highlights of the company's commercial fixture line include lavatories, water closets, drinking fountains, and urinals.

Circle **Item 90** on Inquiry Card

**OVERHEAD GAS-FIRED HEATERS** — Thermobloc Division of Prat-Daniel Corp., South Norwalk, Conn., has issued a 16-page photo album. The booklet, identified as Bulletin P1-57, contains photographic reproductions of Panelbloc overhead gas-fired heaters as installed in a wide variety of commercial and industrial plants. Geographically, the installations cover all sections of the country.

Circle **Item 91** on Inquiry Card

*(Continued on page 154)*

TEMKON

Air Conditioning and Refrigeration

**TEMPERATURE LIMITED**

Burlington Road,
London, SW6
Cables: Temtur, London

*Largest Producer of Air Conditioning Units outside the U.S.A.*

...condensed consumer reports
from the files of

# standard

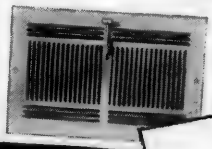
registers
and grilles

**B-24 PERIMETER BASEBOARD DIFFUSERS**

Mad Maud used to fume
When air blasts blew her from the room,
But B-24 changed her wrath to revel,
By maintaining comfort at a very high level!

**PERIMETER BASEBOARD REGISTER NO. 551**

Frozen Frank was in a snit;
found cold corners wherever he'd sit.
But with the 551's four way diffusion,
He now has comfort in profusion!



**PH SERIES PERIMETER FLOOR REGISTERS**

When Circle Sal entertained the ladies,
They found her home as hot as hades.
PH Registers restored her station,
Through perfect heat regulation!

**CEILING AIR DIFFUSERS**

Sinus Sam was a martyr true;
Stuffy air turned him blue,
'Til he put Ceiling Air Diffusers in.
Now he's in the pink again!

MORAL: If you want to keep
your customers happy
mail this coupon
and make it snappy!

**STANDARD**

...first in engineering for indoor comfort

**STANDARD STAMPING & PERFORATING CO.**
314[illegible] W. 49th Place, Chicago 32, Illinois
Gentlemen: Please send me your new catalog showing the complete line of STANDARD STAMPING REGISTERS AND GRILLES.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

Cross section shows structural superiority of Aeromaster's new, extruded aluminum-alloy blades in diameters from 9' to 22'.

# NEW! EXTRUDED ALUMINUM Blades on AEROMASTER* fans only

AEROMASTER'S new, extruded aluminum blades combine in one design the advantages of a light weight metal, a hollow structure and the superior strength of wrought metal... Silicon-magnesium aluminum alloys resist corrosion. Their fine grain structure, high tensile strength and increased endurance eliminate danger from wear, vibration, and metal fatigue... true airfoil blade sections assure maximum air delivery... adjustable blade pitch angle permits decrease of fan load to an accurate minimum horsepower requirement.

The AEROMASTER fan is easily assembled *in the tower*. No special handling equipment is necessary. AEROMASTER fans cost less to install, less to operate, less to maintain!

For more details write to KOPPERS COMPANY, INC., Aeromaster Fan Dept., 6910 Scott Street, Baltimore 3, Maryland.

KOPPERS

Aeromaster Fans

Engineered Products Sold with Service

*Koppers Trademark

1. Drill the hole.
2. Insert the plug—then drive home the same Bulldog you drilled with. Taper end snaps off easily.
3. Expansion is at bottom, providing the powerful Bulldog grip. Threaded shell holds choice of bolt.

BULLDOGS* bite into concrete in seconds... *Anchor Anything Permanently!*

Underwriters' Laboratories and Factory Mutual Approved

- **NO DRILLS TO BUY**—no special tools required—no explosive charges. *Bulldog* drills its own perfect fit!
- **POSITIVE HOLDING POWER**—¼" size, holds up to 3150 lbs.... ⅞" size, 19,620 lbs.!
- **FIRESAFE, CASE-HARDENED STEEL**—with sharply machined drilling teeth!
- **SIZES 3/16" to 7/8"**—and 5 types of anchors: special flush, flush, rod hanger, tie wire, and stud bolt!

BULLDOG 2 in 1

COMBINATION DRILL AND ANCHOR

SAVE TIME, LABOR and DOLLARS

SEE YOUR SUPPLIER...

SEND FOR FREE SAMPLE

THE GRIP THAT NEVER FAILS

J. D. POLIS Manufacturing Co.

2902-6 W. 26th Street • Chicago 23, Illinois


## NEW CATALOGS

*(Continued from page 152)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**SEALLESS PUMPS**—A comprehensive 8-page catalog describing the company's Flex-i-liner sealless plastic and stainless steel pumps and containing useful technical data and material selection information is released by Vanton Pump & Equipment Corp., Division of Cooper Alloy Corp., Hillside, N. J. The catalog includes an explicit description of how the pumps work, performance data with pump characteristic curves, and charts with sizes, capacities, and operating pressure ranges.

Circle **Item 92** on Inquiry Card

**MAGNETIC MOTOR STARTERS** — 20-page publication, GEA-6611, contains comprehensive data on new NEMA Size O and 1 magnetic motor starters for such applications as machine tools, pumps, blowers, fans, and motor control center. Illustrated bulletin from General Electric Co., Schenectady, N. Y., shows how product's design contributes to fast installation, simplified wiring, easy inspection and maintenance, long life, quiet and dependable operation, and maximum flexibility. Color publication describes all available forms and enclosures.

Circle **Item 93** on Inquiry Card

**LIQUID STRAINERS**—Self-cleaning liquid strainers are described in a bulletin published by Golden-Anderson Valve Specialty Co., Pittsburgh, Pa. The Banks continuous strainer is especially designed for the straining of fluids without interrupting the flow for cleaning the screen. Since the screen is constantly kept clean, small perforations of 0.023-inch dia are used, which effectively stop the smallest of troublesome particles. In addition, hand or motor-operated scraper assures minimum pressure drop through strainer at all times.

Circle **Item 94** on Inquiry Card

**OIL BURNING INFORMATION** — A newly issued oil burning manual, No. OB-572, is available from Cleveland Fuel Equipment Co., Cleveland, Ohio. Planned as an aid to the designer, installer, and operator of oil burning boilers, the manual gives data, formulas and general information leading to improved performance and efficiency of the combustion system. Each of the variable factors encountered in oil burning equipment is treated in a clear, easily understood manner. Importance of each step in the combustion process, as related to overall efficiency, is discussed in order of its appearance in the operation.

Circle **Item 95** on Inquiry Card

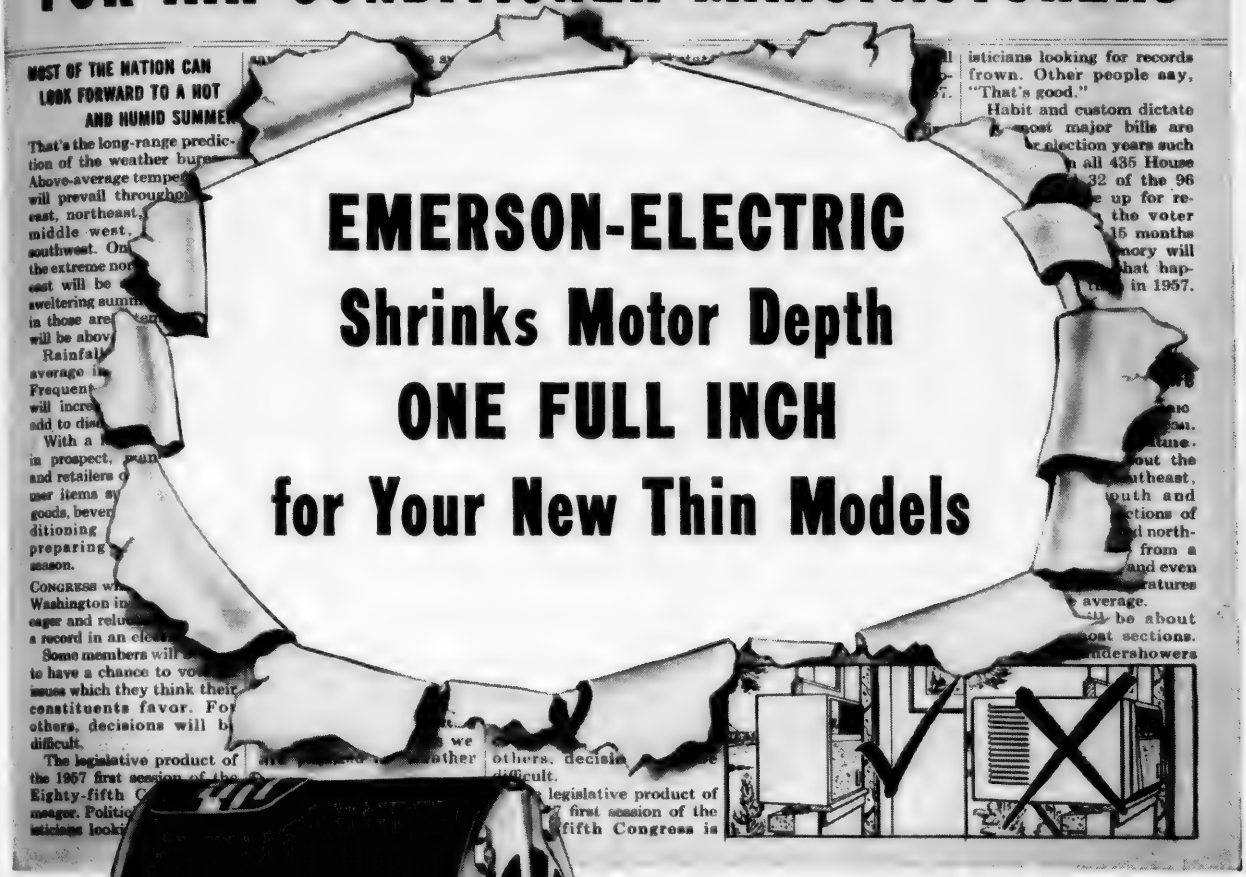
*(Concluded on page 156)*

EXTRA

# IMPORTANT NEWS FOR AIR CONDITIONER MANUFACTURERS

EXTRA

## EMERSON-ELECTRIC Shrinks Motor Depth ONE FULL INCH for Your New Thin Models



### *The Trend for '58*

More compact . . . yet *without* loss of power! New Emerson-Electric shaded-pole motors have been reduced *one full inch* between the motor hubs. You will need these thinner motors in designing your new models!

Call, wire or write Dept. M-80 today for complete information, The Emerson Electric Mfg. Co., St. Louis 21, Mo.

**EMERSON-ELECTRIC** of St. Louis

*LIVE BETTER ELECTRICALLY*

Since 1890

for DUST

CONTROL

install

FLEXAUST®

HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of dust collecting uses, particularly good for elbows and moving hoods.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

*Write for details today*
**Distributors**
**in all principal cities**

THE FLEXAUST COMPANY
Dept. HV-10
100 PARK AVE., NEW YORK 17, N.Y.

# NEW CATALOGS

*(Concluded from page 154)*

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

**AIR CONDITIONING PRODUCTS** — A new general products catalog containing 150 photos and brief descriptive copy is announced by The Trane Company, La Crosse, Wis. Revised from cover-to-cover, the 32-page catalog has up-to-date information on new and redesigned company products. The catalog contains a handy front cover index, 14 tables of condensed performance data, and product capacities and styles.

Circle **Item 96** on Inquiry Card

**EVAPORATIVE CONDENSERS** — Baltimore Aircoil Co., Baltimore, Md., has recently published a 12-page bulletin featuring their latest line of CM blow-through and CU draw-through evaporative condensers. This bulletin covers the complete line of centrifugal fan units in 18 sizes, from 10 to 350 tons, for Freon 12, Freon 22, and ammonia. Complete selection data, plus detailed dimensional drawings, are also included.

Circle **Item 97** on Inquiry Card

**INDUSTRIAL BURNERS** — Coen Company, San Francisco, Calif., has issued a 12-page catalog on its Fyr-Compak industrial burners. These burners are for gas or oil or combination firing. They are complete with combustion control, safety equipment and forced draft air system. They range in capacity from 4000 to over 60,000 lb per hr of steam, making it the biggest single-flame packaged burner yet built to fire pressurized furnace packaged boilers.

Circle **Item 98** on Inquiry Card

**PLASTIC PROTECTORS** — A complete line of plastic plugs and caps for protecting internal and external threaded parts, and ends of tubes is described and illustrated in an 18-page two-color bulletin, No. P-5708, offered by S. S. White Plastics Div., New York, N. Y. Over 200 different plastic protectors are discussed in the bulletin, including the company's Quality Line, molded from rigid acetate, and the Economy Line, from flexible vinylite.

Circle **Item 99** on Inquiry Card

**CONTROLLED CLIMATE** — Armstrong Furnace Company has completed production of a 22-minute, full color, non-commercial film on heating and air conditioning, entitled Controlled Climate. As a companion piece to the film, the company has prepared a 24-page, full color comic book which is commercial, describing company products and systems. The film is available by writing to Armstrong Furnace Co., Sales Promotion Dept., 851 West Third Ave., Columbus 8, Ohio.

TAKE THE GUESSWORK OUT OF ESTIMATING

High Velocity Air Movement Systems

IN ONE COMPLETE PACKAGE

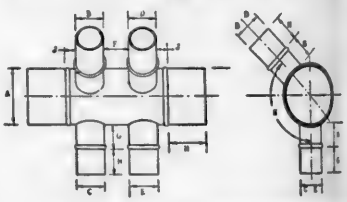
1 SPIRAL *Lockseam* PIPE

Spiral pipe, matched fittings and sound absorbers . . . all custom made to cut costs . . . quicker and pin-point estimates. Next time, specify United's spiral pipe fittings and sound absorbers . . . all in one complete package.

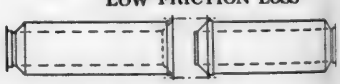
Spiral Pipe Standards and Sizes

• 26 gage zinc-coated steel—diameters 3" through 8" • 24 gage steel—9" through 22" • Standard length 12'—lengths to 20' if required • Available in any specified metal 20 to 30 gage

2 MATCHED FITTINGS
AVAILABLE FOR EVERY SPIRAL PIPE DIAMETER



3 SOUND ABSORBERS
HIGH PRESSURE
LOW FRICTION LOSS



Write For Free Catalog Showing Detailed Specifications and Applications

UNITED
Sheet Metal Co.

549 S. Drexel Ave. Columbus 9, Ohio
Telephone: BElmont 5-3495

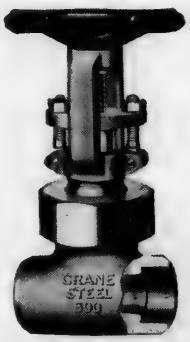
# When specifications say "Welded Piping" get everything for the job from CRANE

It is far more satisfactory to get *all* your welding piping materials . . . fittings, flanges, valves, nipples, pipe... from *one* source—CRANE.

*Then you're sure of uniform quality.* Whether the product is a simple fitting or 24-inch high-pressure, high-temperature valves, Crane controls quality—from raw materials to the finished product.

Each welding type fitting, flange or valve you get from Crane is produced and inspected to established standards—assuring uniform size, wall thickness, and dimensional accuracy—for a good welding job.

*One source of supply*—from Crane—simplifies ordering, bookkeeping and stock-keeping. Prompt delivery service can be had from Crane's 141 branches, or from wholesalers who serve all areas.




Send for this new Circular of Crane Quality Materials for Welded Piping. Ask for AD-2289.

# CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

*Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas*

# DRY AIR...
## PRECISELY as you want it

## NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

**This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.**

***The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is***

**Best and most effective because** . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always.

**Most reliable because** . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

**Most flexible because** . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

**Easiest to take care of because** . . . the apparatus is simple, parts are accessible, controls are trustworthy.

AT THE
**CHEMICAL SHOW**
26th EXPOSITION OF CHEMICAL INDUSTRIES
Coliseum, New York City, December 2 – 6, 1957
See NIAGARA
AIR CONDITIONERS • Aero HEAT EXCHANGERS
Aero AFTER COOLERS • Aero REFRIGERANT CONDENSERS • Aero STEAM CONDENSERS
Aero VAPOR CONDENSERS • HUMIDIFIERS
HEATERS • COOLERS • DRYERS
BOOTH No. 655

**The cleanest because** . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

***Write for full information; ask for Bulletins 112 and 121. Address Dept. HV-10.***

**NIAGARA BLOWER COMPANY**
**405 Lexington Ave., New York 17, N. Y.**
District Engineers in Principal Cities of U. S. and Canada




tube type radiation. Its opening marks one of the many recent advancements in the progress of hydronics, the science of heating and cooling with water, it was announced.

• **IN OPERATION SINCE JUNE**—Fully equipped, staffed, and in operation since June, the laboratory was built for industry at a cost of about $75,000. Purpose is to supply supplementary and check test information on radiation which has I-B-R ratings. Tests for these output ratings are first conducted by the manufacturer in his own laboratory. Test data is then compared with results of check testing at the I-B-R lab.

• **FOUR NEW GUIDES**—Published shortly will be four new I-B-R guides. No. 500, covering design and installation of all types of heating systems, will replace present No. 100 and 5. No. 700, offering definitions of various items comprising hot water and steam heating systems, will contain approximately 40 sketches of proper piping details. No. 900 will be a calculation and installation text on liquid cooling systems. A guide on design and calculation of snow melting systems is also planned for the near future.

## NEW PROGRAM

**to protect specifiers and users of air moving equipment is result of two years of planning.**

Advance details of an international program to protect specifiers and users against incorrect or improper performance ratings of air moving equipment such as centrifugal, axial, and propeller fans, and power roof ventilators, were revealed by Air Moving and Conditioning Association to a gathering of trade press editors, September 6, at Chicago's Palmer House.

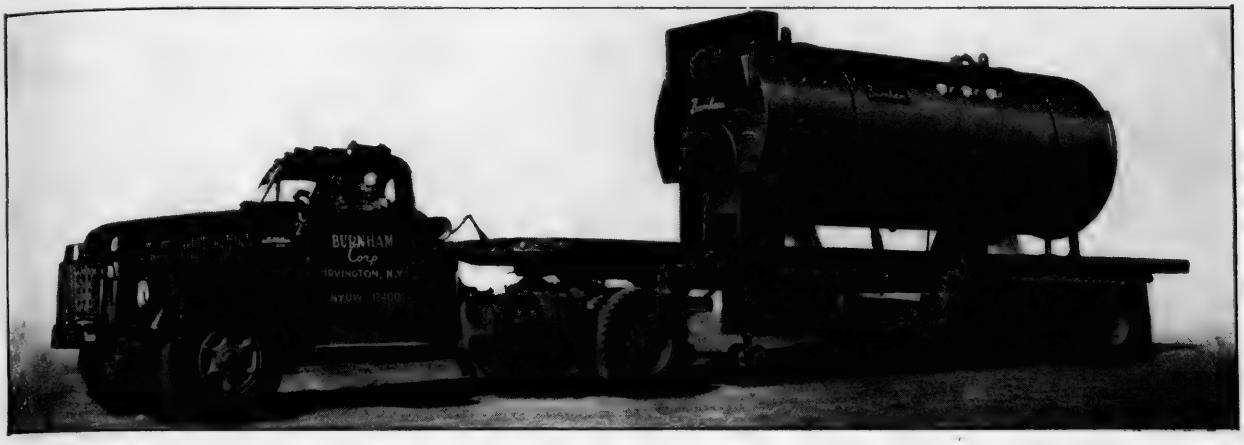
The result of almost two years of planning by AMCA, the program provides a means of identifying products which have been properly tested and their performance accurately rated according to a uniform procedure set up under the AMCA Standard Test Code.

This is the first time, states AMCA, that business, industry, and the public has been offered such assurance that air moving equipment will perform as the manufacturer claims.

It is expected that practically all leading U. S. and

*(Continued on page 160)*

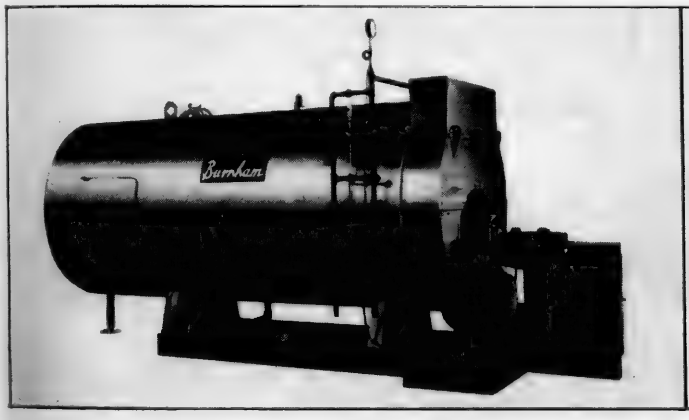
# BURNHAM Scotch Type Boilers Are NOW Available As Completely Packaged Units

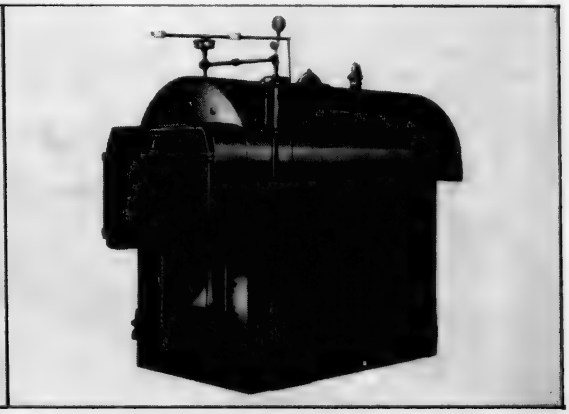



**STANDARD SCOTCH TYPE with WIND BOX — ready for fast, on-the-job delivery**

All Burnham Scotch Type Steel Heating Boilers conform fully to S.B.I. ratings and low pressure A.S.M.E. boiler code construction. Skilled craftsmen have built them to the finest standards of the industry. Capacities from 2,600 to 35,000 sq. ft. E.D.R. steam and from 4,680 to 56,000 sq. ft. E.D.R. water, net S.B.I. ratings.

***Special Burnham Trailer Trucks assure fast delivery and efficient unloading.***



**COMPLETE PACKAGE, READY TO GO**

This 7,000 sq. ft. boiler and combustion unit were teamed after consultation with many burner experts and extensive testing. Through the entire line, Burnham has built the finest in boilers . . . then studied the output of many leading burner manufacturers to select the finest and most suitable combustion units.

**BURNHAM COMPACT TYPE BOILER**

These welded steel Compact Type Boilers compress the utmost heating capacity into the practical minimum of floor space. Available in capacities from 2,600 to 35,000 sq. ft. E.D.R., steam and with comparable water ratings — all S.B.I.

***Stock Boilers available for prompt shipment.***

*Burnham Corporation*

STEEL BOILER DEPARTMENT
IRVINGTON, NEW YORK

Burnham Corporation — ACH-107
Steel Boiler Department
Irvington, New York

Please give me, without obligation, full ratings and data on:
Scotch Type Boilers ☐ Boiler-Burner Packages ☐
Compact Boilers ☐

Name .....
Address .....
City ..... State .....

Jackson & Church furnaces

solve difficult heating problems of new Crown Cork and Seal plant —

INSTALLATION DATA

PLACE:
New lithograph plant of Crown Cork & Seal Company's Can Division, Philadelphia, operating five of the latest litho presses and five coaters and ovens

REQUIREMENTS:
Dependable heating designed to supply large volume of fresh outside air replacing oxygen consumed by lithograph equipment. Summer air conditioning to utilize same ducts and fans

HEATING UNITS SPECIFIED:
Three JACKSON & CHURCH GA-4750 units, having a total air delivery of 120,000 C.F.M. and 14,250,000 Btu input

MANUFACTURER:
JACKSON & CHURCH - Div. of YORK-SHIPLEY, INC. York, Pa. (J-C furnaces - America's largest & most complete warm air heating line)

DISTRIBUTOR:
Furnace Distributors, Inc. Philadelphia, Pa.

INSTALLER: Consolidated Air Conditioning

Modern façade of Crown Cork & Seal Company's new plant in Philadelphia

J-C

JACKSON & CHURCH
Division of
YORK-SHIPLEY, INC.
P.O. BOX 349, YORK, PENNSYLVANIA



Canadian manufacturers of this equipment will take part in this program which is scheduled to become effective as rapidly as possible.

• **TO INSPECT ALL TEST LABORATORIES**—In order for a manufacturer to qualify his product for this program, all tests and performance ratings must have been made in a test laboratory (either the manufacturer's own laboratory or a neutral one) which has been inspected and approved by AMCA during an actual test. Test equipment, procedure, and competency of personnel must meet the highest standards for approval, the Association states. Following approval, all test laboratories are subject to periodic inspection to see that standards are being maintained.

• **CONTRACT BINDS MANUFACTURER**—All manufacturers taking part in the program will sign a license agreement with AMCA to maintain manufacturing control so that each unit of the same size and type will have identical performance ratings. The right to identify their products with the AMCA program will be withdrawn from any manufacturer for any violation of the license agreement.

• **RATINGS RESULT FROM APPROVED TESTS**—Performance ratings of products qualified under this program must be the result of tests in approved laboratories and/or permitted calculations set forth in the AMCA Standard Test Code.

• **JANUARY 2 IS TARGET DATE**—The monumental job of inspecting and qualifying test laboratories all over this country and Canada, and checking test and performance data submitted by each manufacturer is now in progress. Target date for completion of this work and announcement of complete details of the AMCA program, including a list of approved test laboratories and names of participating manufacturers, is set for January 2, 1958.

## SPACE HEATING

**with aluminum foil wall coverings to be explored at new, consolidated, fundamental research facility.**

The nation's first fundamental research facility to serve the rapidly growing foil and packaging industries was announced by Aluminum Company of America, Pittsburgh, Pa.

To be located at New Kensington, Pa., and known as the Foil and Packaging Division of Alcoa Research Laboratories, the facility is ready to seriously explore, among other things, the feasibility of space heating with aluminum foil wall coverings. Also, ways will be sought to improve home insulation, to broaden foil's decorative possibilities, to determine the practicalities of solar heating and cooking with foils, and to develop a very sizable list of container and packaging possibilities.

Meanwhile, on a day-to-day basis, the company announces, the laboratory will be assisting its customers in their important problems with foil.

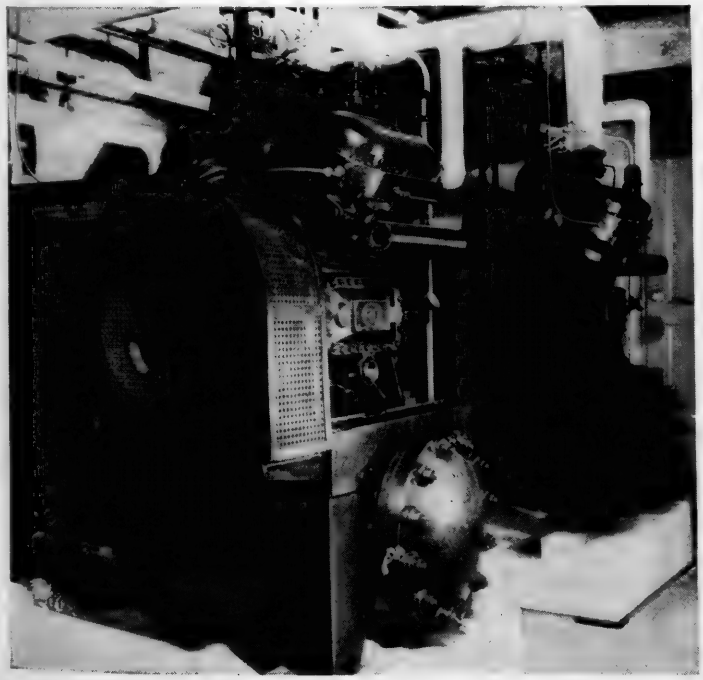
*(News of the Month continued on page 162)*

# Air Conditioned Throughout with TRADE FRICK MARK Refrigeration

4200 Marine Drive Apartments, Chicago, Ill. Architect: Lewis Simon. Mech. Eng.: Arthur Wallace. Installing Contractors: Midwest Eng. & Equipment Co., Economy Plumbing & Heating Co.

**These sixty-four new apartments at 4200 Marine Drive, in Chicago, enjoy complete air conditioning, among other advantages.**

Two "ECLIPSE" refrigerating units, installed by Midwest Engineering and Equipment Co., Frick Sales-Representatives in Chicago, carry the cooling load with economy and dependability.



What are YOUR cooling needs? If you want cool air, cold drinking water, ice, freezer temperatures, or refrigeration for processing—in any commercial or industrial size—let us quote now on your requirements. Branches and Distributors in principal cities, the world over.

Frick "ECLIPSE" refrigerating units at 4200 Marine Drive Apartments, Chicago

DEPENDABLE REFRIGERATION SINCE 1862

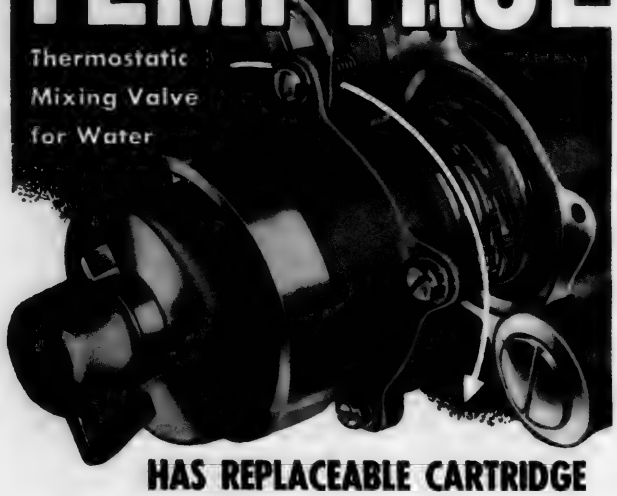
**FRICK CO.**

WAYNESBORO, PENNA., U. S. A.

NEW FAIL-SAFE Symmons

# TEMPTROL

Thermostatic Mixing Valve for Water



## HAS REPLACEABLE CARTRIDGE

**TEMPTROL** – the new and only fail-safe thermostatic water mixer available with these outstanding features . . .

**REPLACEABLE CARTRIDGE** – which houses all working parts.

**INSTANT SERVICE** – Temptrol, with check stops, need never be removed from the line for costly servicing. A screwdriver to remove but four screws permits one to slip in new cartridge, if necessary—quickly—safely.

**CONSTANT TEMP** – hot water temperature is continuously and accurately maintained at all times.

**ADJUSTMENT** – temperature range from 90° all the way up to 180°.

**AUTOMATIC** – instant compensation for supply line temperature and pressure changes . . . safely shuts down on hot or cold failure.

**INSTALLATION** – can be installed at the heater as a Master Control, or anywhere along the line as a Zone Control.

**CORROSION FREE** – stainless steel control unit and electrolized sleeve assure extra long life and trouble-free performance.

**ADDITIONAL PROTECTION** – solid fill thermal element mounted out of the water in protected chamber open only to atmosphere.

**AVAILABLE NOW** – in four sizes: ¾", 1", 1¼" and 1½".

**Truly a non-competitive item.**

See SWEET'S ARCHITECTURAL FILE, DOMESTIC ENGINEERING CATALOG or write us direct for further information

Symmons ENGINEERING COMPANY

445 C STREET, BOSTON 10, MASSACHUSETTS




## RESEARCH FACILITATED

**—on heat transmission through light-transmitting materials under sun exposure — by TAC survey.**

Heating and air conditioning engineers, architects, building owners and managers interested in the measurement of heat transmission through light-transmitting materials under sun exposure now may arrange to have this type of study conducted, the American Society of Heating and Air-Conditioning Engineers reports.

Such solar energy studies require special laboratory facilities. In order to find out where this research might be conducted the Society's Technical Advisory Committee on Heat Transfer Through Fenestration surveyed a number of organizations.

• **ORGANIZATIONS LISTED**—R. W. McKinley, Pittsburgh, Pa., Chairman of the committee, says the inquiry revealed there are at least twelve institutions interested in discussing such research programs with potential sponsors. Their facilities vary widely.

The interested organizations are Battelle Memorial Institute, Columbus, Ohio; Columbia University, New York, N. Y.; Duke University, Durham, N. C.; Cornell University, Ithaca, N. Y.; University of Maryland, College Park, Md.; University of Michigan, Ann Arbor, Mich.; University of Minnesota, Minneapolis, Minn.; The Pennsylvania State University, University Park, Pa.; New York University, New York, N. Y.; Purdue University, West Lafayette, Ind.; Rensselaer Polytechnic Institute, Troy, N. Y.; Southern Methodist University, Dallas, Texas.

## WIND TUNNEL

**designed to study vent top operation and air flow over roof-tops.**

A wind tunnel has been constructed by research engi-

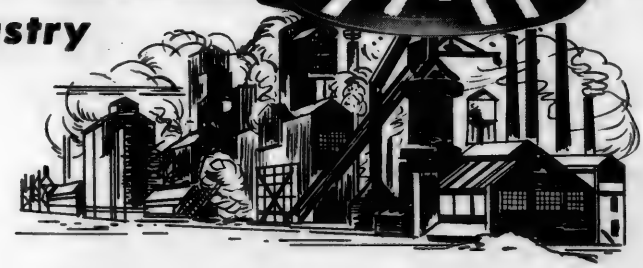
neers of the Metalbestos Division, William Wallace Co., Belmont, Calif., for controlled study of vent top opera-

*(Concluded on page 164)*

# Quickdraft...

## the world's most efficient power exhauster

## ...for industry



## ...for institutions

## ...for residences

Patent Num. 2,722,372.
Other Patents Pending.

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE

★ NEEDS NO STACKS

★ ACID RESISTING VITREOUS ENAMEL FINISH

FOR INDUSTRY, Quickdraft excels in venting paint booths . . . abrasives . . . corrosive gases . . . noxious fumes . . . high temperatures and moisture. Its blower operates in clean or outside air. It eliminates down-time for cleaning and replacing fan blades. It improves industrial venting and reduces maintenance costs!

FOR INSTITUTIONAL AND COMMERCIAL BUILDINGS, Quickdraft efficiently vents heating plants, water heaters and incinerators at roof level. It saves the cost of building unsightly tall stacks.

FOR RESIDENCES, Quickdraft makes low, cold and erratic chimneys function. On and off with the fire, Quickdraft maintains constant draft required for efficient and economical combustion of all fuels. It eliminates pulsating or chattering, puffing, smoking and sooting.

SEND FOR QUICKDRAFT ENGINEERING DATA ON YOUR VENTING OR HEATING APPLICATIONS . . . TODAY.

N-600-QD

**Quickdraft**
**CORPORATION**
P. O. Box 87-O • Canton 1, Ohio

### IMPORTANT NOTICE

In addition to standard acid resisting vitreous enamel finish, all Quickdraft units are available in No. 316 Stainless Steel or in rigid Polyvinyl Chloride for withstanding highly corrosive gases. With static pressures up to 12-inches, Quickdraft is ideal for materials handling applications.

*you want 'em? we got 'em!*

28 FULL LINES!

*d-h* AIR CONDITIONING

SPOTAIRE ROOM-by-ROOM AIR CONDITIONERS: **#1** d-h LRC's: basic unit, concealed or deluxe cabinet; 4 models, 200 thru 600 cfm. **#2** d-h VRC's: concealed or deluxe consoles; 3 models. 200 thru 600 cfm. **#3** d-h HRC's: 3 suspended types, 19 models, 300 thru 1750 cfm.

AIR HANDLING UNITS: **#4** d-h HH Series: ceiling suspended. **#5** d-h HHV Series: floor mounted. Both: 14 models, 624 thru 28000 cfm.

VENTILATING UNITS: **#6** d-h AM: 1752 thru 32250 cfm.

MULTIZONE TYPES: **#7** d-h FLEXAZONE: for simultaneous, independent, variable heating, cooling, ventilating; 1752 thru 32250 cfm.

PACKAGED AIR CONDITIONERS: **#8** d-h AECR: with built-in evaporative condenser. **#9** d-h SCR: with water-cooled condenser. Both, 7½ thru 75 H.P.

PACKAGED STORE COOLERS: **#10** d-h DYNA-PAC & ROYALAIRE: 2 thru 15 tons.

PACKAGED WATER CHILLERS: **#11** d-h CWG: 7½ thru 75 H.P. **#12** d-h CWG-E: attached evaporative condenser. Both 7½ thru 75 H.P.

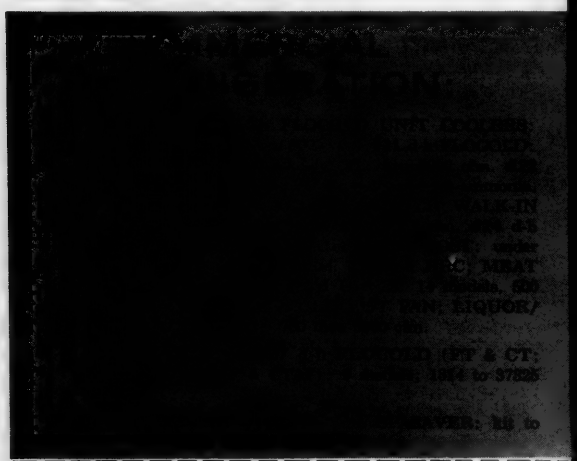
EVAPORATIVE CONDENSERS: **#13** d-h PERMA-FAN: 13 models; 5 thru 110 tons.

COILS: **#14** Extended surface; steam, water, DX **#15** Type "H"; small applications, DX or chilled water.

PACKAGED WATER CHILLERS: **#16** d-h AC; air cooled. **#17** d-h WC: water cooled. Both, 2, 3, 5 H.P.

COOLING TOWERS: **#18** d-h WMT: 13 models, 5 thru 100 tons.

AIR-COOLED CONDENSERS: **#19** d-h ACC: 5 models, 2 thru 20 tons.



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*drayer-hanson*

DIVISION OF NATIONAL-U.S. RADIATOR CORP

3301 MEDFORD STREET

LOS ANGELES 63, CALIFORNIA

CABLE: FORTRADE LOS ANGELES



tion and air flow over residential and commercial rooftops.

The wind tunnel, which will be placed in operation sometime this year, is expected to produce a wind velocity of over 60 mph. It is powered by a 100-hp automotive engine using a pulley drive to turn a 5½-ft airplane propeller. The entrance nozzle is uniquely designed to provide uniform air flow across a 5-ft square test section in the central test chamber.

• **TO AID APPLICATION DESIGN**—Completely-enclosed test chamber will allow full-scale testing of vent tops in controlled velocities and pressures up to the maximum wind velocity to which vent tops are normally subjected. The same test chamber will also be used to study air flow over model homes and buildings to locate pressure areas. This data will be used by the company's research engineers in determining optimum placement of vent tops on roof surfaces.

First tests of the wind tunnel will be devoted to establishing internal flow patterns and calibration of instruments. Later tests will be made to indicate performance criteria for gas vent tops and to obtain satisfactory operation of vent tops over a wider variety of wind directions.

In the opinion of company's research engineers, the wind tunnel will yield important information leading to improved application of vent and chimney tops.

## SOUTH AFRICAN

**skilled labor shortage pushes air conditioning sales up. All hotels will have summer cooling.**

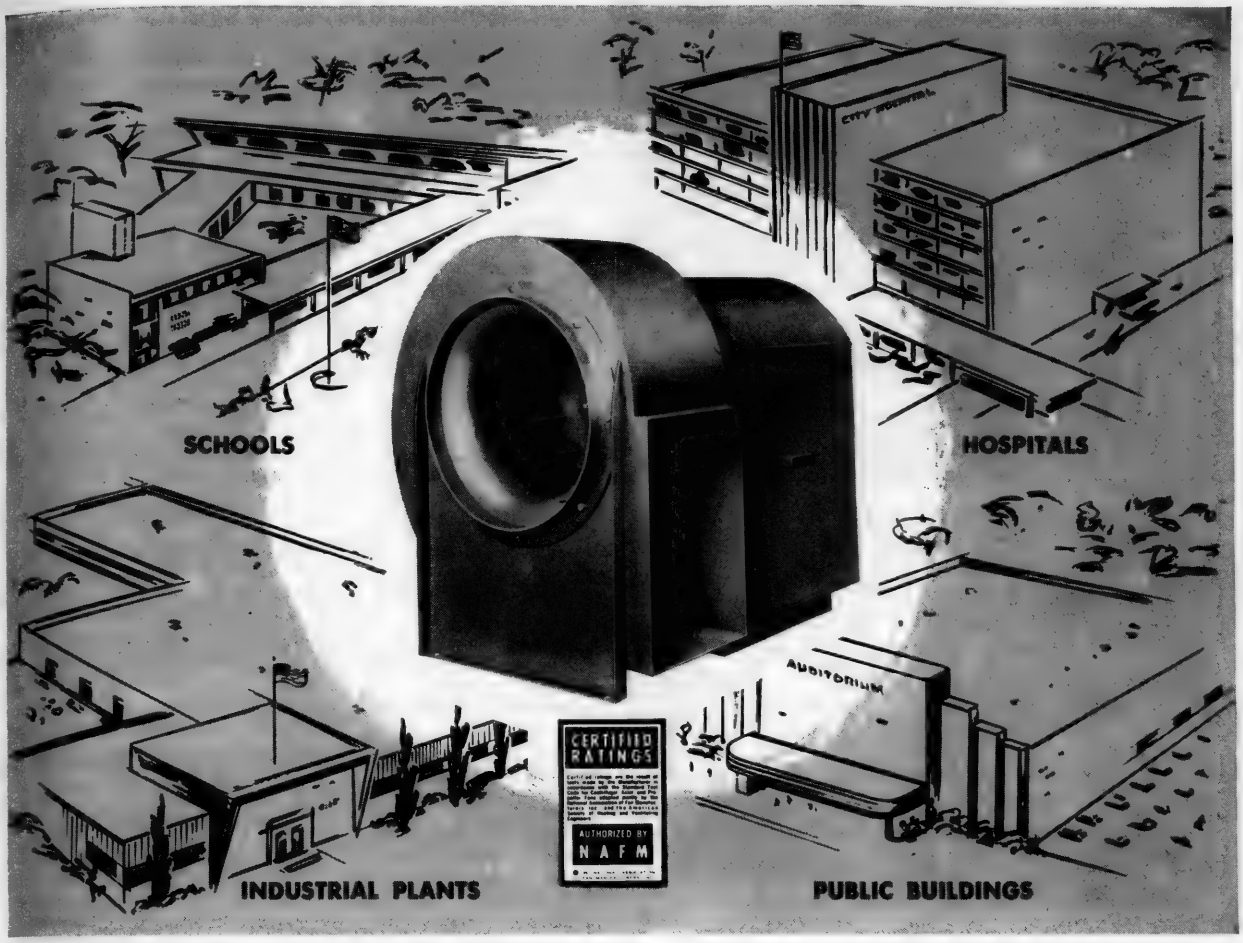
Competition for skilled labor between the mining industry and growing secondary industries in South Africa is contributing markedly to the increasing sales of air conditioning equipment there, according to D. J. C. Nelson, manager of the air conditioning and refrigeration department, J. L. Clark and Company, Limited, Trane Company distributors in Johannesburg, South Africa.

South Africa is experiencing a definite shortage of skilled labor. For many years the mining industry had no competition for this help. Now, with the increasing importance of other industries, there is keen competition and many companies are turning to air conditioning as the inducement they need to hold and attract personnel.

• **FOUR ZONES**—Nelson listed four climatic zones for South Africa: Transvaal, Natal, and Cape Peninsula where air conditioning has made considerable headway in the past decade, with the fourth, Karroo, a lesser populated, somewhat barren area, where air conditioning is almost non-existent.

Comparing the city of Durban in the Natal as the "Miami of Africa," Nelson forecast that all hotels there will be air conditioned within the next few years and that industrial air conditioning is also gaining.

The air conditioning trend in South Africa is not nearly as pronounced as it is in the United States. However, the same growth pattern is developing and if it holds true, a definite surge in cooling demands in the near future can be expected.




# A Peerless Blower for Every Application

Quiet, dependable, trouble-free Peerless blowers require a minimum of installation space and reduce mounting costs. They offer countless discharge arrangements. The entire unit is built by Peerless, including the motor.

Peerless blowers meet and excel industry standards. They have been thoroughly tested according to test codes. Thousands of them are providing economical, continuous ventilation in installations all over the country.

Write today for Bulletins SDA-160, SDA-200 and SDA-220!

***A COMPLETE LINE OF AIR MOVING EQUIPMENT***

Charter Member of the Air Moving and Conditioning Association, Inc. (AMCA)

Peerless Electric

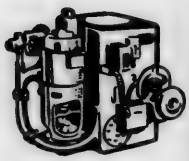
FAN AND BLOWER DIVISION

**THE Peerless Electric® COMPANY**

1400 W. MARKET ST. • WARREN, OHIO

FANS • BLOWERS • ELECTRIC MOTORS • ELECTRONIC EQUIPMENT

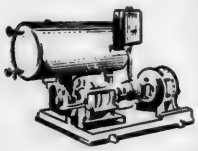
Look for our Catalog in Sweet's



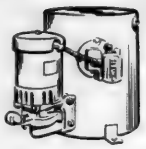
TYPE VV

# Toughest line of Condensate Pumps ever made?

TYPE U



TYPES B and C



TYPE MR

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SDV

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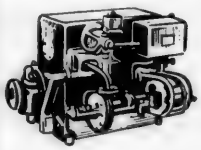

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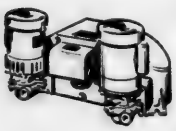

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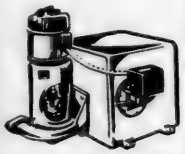

TYPES E, EC and ECD

***For condensate pumps of special capacities or discharge pressures, see your Wheeler-Economy representative or write direct.***

**Wheeler-Economy invites you** to compare its pumps with any others on the market! Many have heavy, close-grained cast iron receivers, and are either flexible-coupled or close-coupled. Others—priced appreciably lower—have steel receivers and are close-coupled.

But *all* Wheeler-Economy Condensate Pumps are built to give a lifetime of service with only routine maintenance. Specially designed mechanical seals eliminate stuffing boxes and the frequent adjustments they entail. Wheeler-Economy units will handle condensate with temperatures to 200°F. Standard capacities range to 100,000 sq. ft. EDR, and discharge pressures to 150 psi.

Economy Pump Division

**C. H. Wheeler Mfg. Co.** 19th and Lehigh Avenue, Philadelphia 32, Pa.

Please send free information on your heating and air-conditioning pumps.

NAME

COMPANY

STREET ADDRESS

CITY ZONE

STATE

**Centrifugal, Axial and Mixed Flow Pumps • Marine Auxiliary Machinery • Vacuum Equipment • Steam Condensers • Nuclear Products**


# COMING EVENTS

**Where listed, names or titles of individuals are those from whom further information is available**

**NATIONAL SAFETY COUNCIL EXPOSITION**—45th National Safety Congress & Exposition, to be held in Chicago, Ill. Headquarters not yet announced. Secretary of the National Safety Council, 425 N. Michigan Ave., Chicago, Ill. ..... **OCTOBER 21-25, 1957.**

**APPLIED METEOROLOGY CONFERENCE**—First national conference on Applied Meteorology, sponsored by the American Meteorological Society, to be held at the Hotel Statler, Hartford, Conn. K. C. Spengler, executive secretary of the Society, 3 Joy St., Boston 8, Mass. ..... **OCTOBER 28-29, 1957.**

**HYGIENE FOUNDATION MEETING**—22nd annual meeting of the Industrial Hygiene Foundation at Mellon Institute, Pittsburgh. Secretary of the Institute, 4400 Fifth Ave., Pittsburgh 13, Pa. ..... **OCTOBER 30-31, 1957.**

**AIR POLLUTION CONFERENCE**—Air Pollution Conference, to be held in Chicago, Ill. Headquarters not yet announced. Co-sponsored by Armour Research Foundation and the Midwestern Air Pollution Prevention Association. Conference secretary of Armour Research, 10 W. 35th St., Chicago 16, Ill. ..... **NOVEMBER 13-14, 1957.**

**ASRE MEETING**—Semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Shoreland, Chicago, Ill. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **NOVEMBER 14-16, 1957.**

**REFRIGERATION CONTRACTORS CONVENTION**—Annual convention of the Refrigeration and Air Conditioning Contractors Association, Inc., at the Drake Hotel, Chicago, Ill. Secretary of the Association, 10660 Carnegie Ave., Cleveland 6, Ohio. ..... **NOVEMBER 16-18, 1957.**

**REFRIGERATION WHOLESALERS MEETING**—Annual meeting, Air Conditioning and Refrigeration Wholesalers, Sheraton Hotel, Chicago, Ill. Secretary, 2607 N. High St., Columbus, Ohio. ..... **NOVEMBER 16-18, 1957.**

**AIR-CONDITIONING AND REFRIGERATION EXPOSITION** — 10th exposition of the Air-Conditioning and Refrigeration industry, sponsored by the Air-Conditioning and Refrigeration Institute, at Chicago's International Amphitheatre, Chicago, Ill. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 18-21, 1957.**

**WARM AIR HEATING**—Annual convention, National Warm Air Heating and Air Conditioning Association, Hotel Morrison, Chicago, Ill. George Boedener, Secretary, NWAHACA, 640 Engineers Bldg., Cleveland, Ohio ..... **NOVEMBER 18-22, 1957.**

**ASME MEETING**—Annual meeting of the American Society of Mechanical Engineers, at the Hotel Statler, New York, N. Y. Secretary of the Society, 29 W. 39th St., New York, N. Y. ..... **DECEMBER 1-6, 1957.**

**HOME BUILDERS EXPOSITION**—14th annual convention-exposition of the National Association of Home Builders of the United States, at the Conrad Hilton and Sherman hotels, and the Chicago Coliseum, Chicago. Secretary of the Association, 111 W. Jackson Blv'd., Chicago 4, Ill. ..... **JANUARY 19-23, 1958.**

**ASHAE WINTER MEETING** — 64th annual meeting, American Society of Heating and Air-Conditioning Engineers, Pittsburgh, Pa. A. V. Hutchinson, secretary ASHAE, 62 Worth St., New York, N. Y. ..... **JANUARY 27-29, 1958.**

**NACE CONFERENCE**—14th annual conference of the National Association of Corrosion Engineers, at the Civic Auditorium, San Francisco, Calif. A. B. Campbell, executive secretary of the Association, 1061 M & M Bldg., Houston 2, Texas. **MARCH 17-21, 1958.**

**NUCLEAR CONGRESS**—1958 Nuclear Engineering and Science Conference in Chicago, Ill. Engineers Joint Council, 29 W. 39th St., New York 18, N. Y. ..... **MARCH 17-21, 1958.**

**JOINT ASHAE-ASRE MEETING**—Joint summer meeting, American Society of Heating and Air-Conditioning Engineers and American Society of Refrigerating Engineers. Hotel Leamington, Minneapolis, Minn. A. V. Hutchinson, secretary of the ASHAE, 62 Worth St., New York 13, N. Y., and Secretary of the ASRE, 234 Fifth Ave., New York 1, N. Y. ..... **JUNE 23-25, 1958.**

**EXPOSITION AND ASHAE CONVENTION**—65th annual meeting, American Society of Heating and Air-Conditioning Engineers (Jan. 26-29, 1959) and 14th International Heating and Air Conditioning Exposition, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . **JANUARY 26-30, 1959.**

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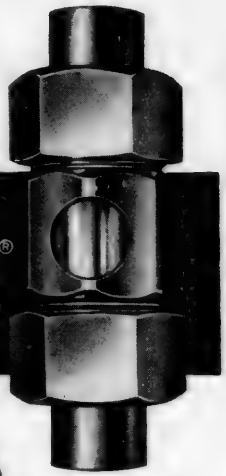

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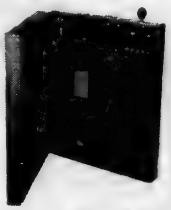

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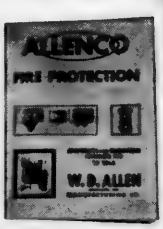


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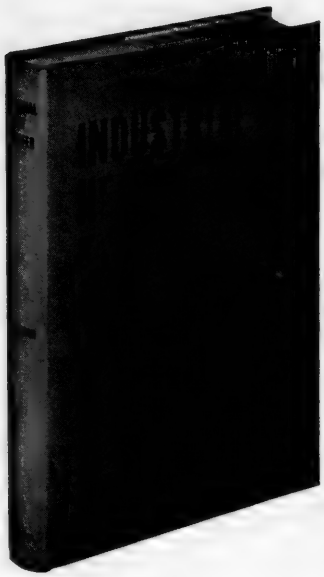

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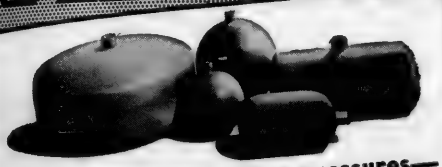

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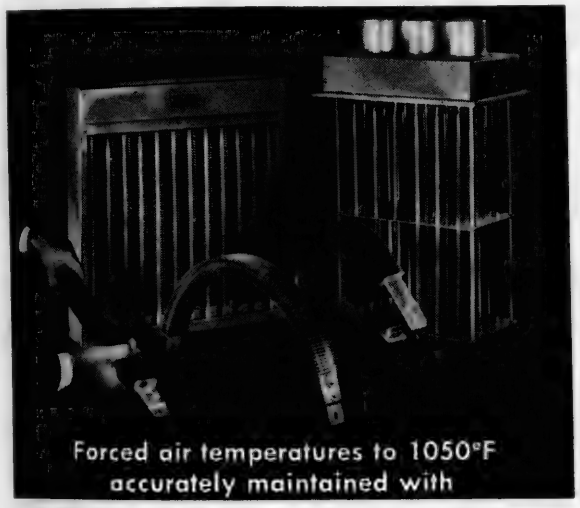


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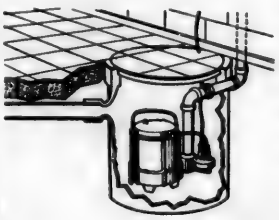

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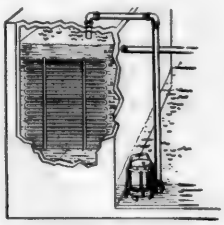

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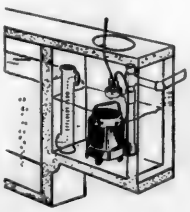

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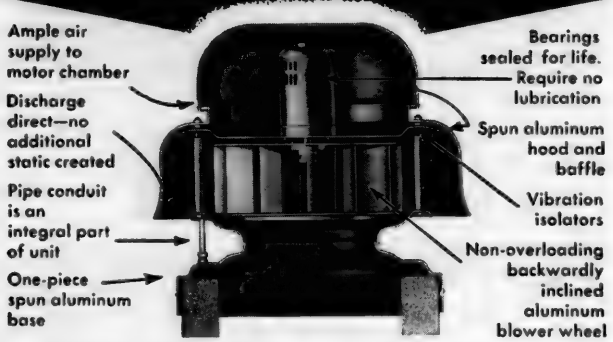
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Non-overloading backwardly inclined aluminum blower wheel

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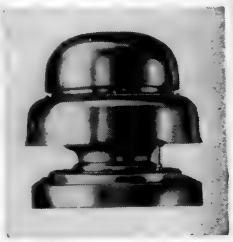

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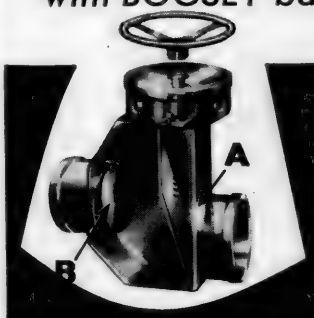


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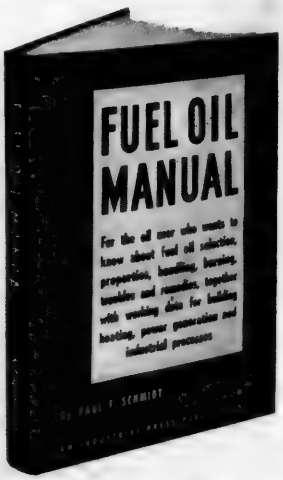


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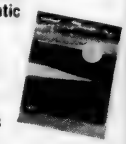

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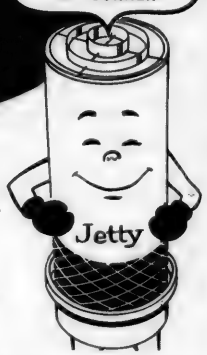


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- Check all velocities from 400 to 10,000 F.P.M.
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Tests fan and blower discharge and inlet pressures, pressure drop across filters, balances air conditioning systems, etc. Complete kit includes dual purpose manometer, 18" stainless steel pitot tube, Magneclips and all necessary fittings, tubings, instructions and accessories.

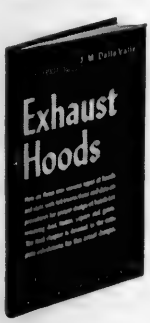
*Write today for literature and prices.*

**F. W. DWYER MFG. CO.**

P.O. BOX 373-N MICHIGAN CITY, INDIANA

---

# EXHAUST HOODS




The only book published that gives comprehensive information on the flow of air around and into the openings, hoods or slots in exhaust ventilating systems. Covers all phases of hood, booth and slot design. Shows how to determine the required air volume and velocity for hoods and other types of openings for the control of all kinds of dusts, fumes and gases. Sample problems, with the solutions worked out in detail, are given in a chapter devoted entirely to this matter.

141 Pages, 127 Illustrations, 30 Tables, $3.50

**THE INDUSTRIAL PRESS**

93 Worth Street New York 13, N. Y.

# Get the Answers!

***To your equipment installation problems***

***If you work with—***

**CENTRIFUGAL COMPRESSORS**

**RECIPROCATING COMPRESSORS**

**COOLING TOWERS**

**AIR HANDLING UNITS**

**PACKAGED LIQUID CHILLERS**

**FANS**

**BLOWERS**

**PUMPS**

**PIPING**

**BOILERS**

**UNIT HEATERS**

***or What have you?...***

**Korfund's complete line of products give you the right answer the first time to your installation, vibration and noise problems. Write for Bulletin 44 which gives full details.**

THE **KORFUND** COMPANY, INC.

48-01E Thirty Second Place,
Long Island City 1, N.Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal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*Advertiser appeared in previous issue.

# ...so QUIET you can install this cooling tower ANYWHERE

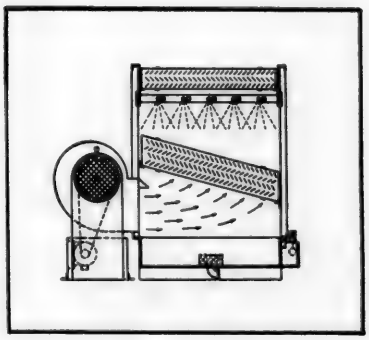
Whisper-quiet Binks 3-B series cooling towers give you complete freedom in establishing their location. Even if conditions dictate that you must place the tower adjacent to hotel or hospital windows, in a residential courtway, or the well of an office building, you can do so with complete confidence that it will disturb no one.

**Whisper-quiet operation.** Tip speed of the squirrel cage blowers does not exceed 2300 ft. per min. as compared with 7000 ft. per min. or more for propeller fan units of equal capacity. Rugged cast iron blower hubs and dynamic and static balancing also insure vibrationless operation.

**Low silhouette.** Overall height of largest capacity tower is only 7'6"—it's seldom visible at street level.

**High efficiency.** Binks patented Roto-jet spray nozzles plus internal redwood nailless decking assure thorough water breakup.

Scientifically balanced air-to-water ratio gives high cooling efficiency under all climatic conditions.



Cross-section showing counter-flow air-water movement employed in Binks 3-B towers.

**Minimum maintenance.** Blowers and motors are outside the tower—not in the moisture laden air stream. All panels are heavily galvanized. Outsides of towers have two coats of aluminum paint. The insides are protected by a durable zinc chromate coating.

**Send for complete data.** Ask your Binks Branch Office, or write direct for a copy of Bulletins 477-A and 333. Binks engineers will be glad to answer your questions and help solve your particular cooling problems. There is no obligation.

7787

**Binks**
*EVERYTHING FOR WATER COOLING*

See Binks NEW cooling tower line ... visit BOOTH 230

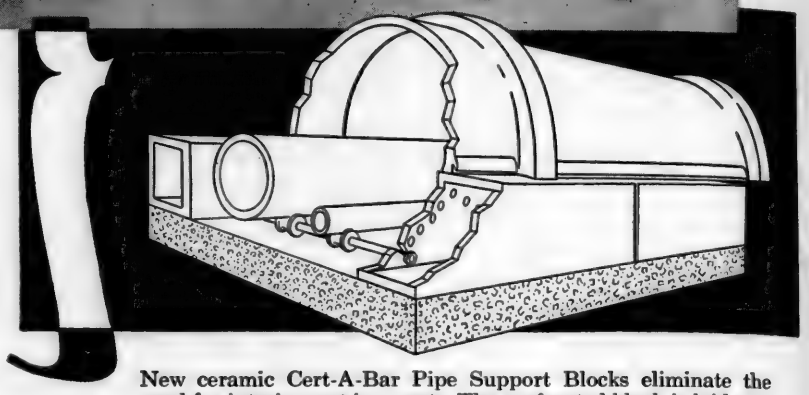
10TH EXPOSITION
Air-Conditioning & Refrigeration Industry
Nov. 18-21 • Chicago

**Binks Manufacturing Company**
3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

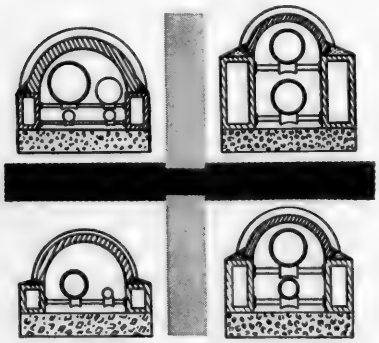
# PERMANENT PROTECTION
## for underground piping!

## STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

THE vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, *but for the life of the piping.* You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications —one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



### THE CERT-A-BAR SYSTEM HAS ALL THESE IMPORTANT ADVANTAGES

- Inherent structural strength for permanent protection
- Complete flexibility for design
- Minimum initial and long-term costs
- Quickly installed
- Keeps pipe insulation dry
- No electrolytic corrosion of piping
- No maintenance required

A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left.

**WRITE FOR**

illustrated, four-page circular with complete installation specifications.

*T.M. Reg. App. For.
Patents Pending

**The Stillwater Clay Products Co.**
**STILLWATER CONDUIT DIVISION**
3334 PROSPECT AVENUE, CLEVELAND 15, OHIO

SW-956-70A

STILLWATER CONDUIT SYSTEMS

## AND PRODUCT INFORMATION SERVICE

**Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.**

**The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.**

**Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.**

### HOW TO TRAP UNIT HEATERS
The above is the title of pages 28 and 29 of steam trap book available. This 44-page catalog is a guide to good trapping practice.
Inside Front Cover — Item 200

### SOUND-POWER OUTPUT CURVES
All company's fans are rated for noise on both the inlet and outlet sides. Ratings in microwatts sound power and decibel sound pressure levels in each of eight octave bands of frequency, measured separately. Information is available.
Page 1 — Item 201

### AIR-COOLED CONDENSERS
All-weather operation of air conditioning and refrigeration units is automatic with company's exclusive modulating valves used in these condensers. Balance maintained between condenser and compressor under all outdoor conditions. Bulletin available.
Page 2 — Item 202

### CONDITIONING PRODUCTS
Company trademark signifies proven dependability, one source—one responsibility—complete line of air conditioning, refrigeration and heating products. Information available.
Page 5 — Item 203

### PRESSURE RELIEF VALVES
Two new ASME rated pressure safety relief valves are offered. Discussed with complete specifications, ratings, and application information in bulletin.
Page 11 — Item 204

### UNFIRED PRESSURE VESSELS
Company has broken what it calls life quality price barriers, combining its 50 years in business with ten years of developing a complete line of linings, so that vessels give complete corrosion protection available heretofore only with expensive alloys and clads.
Page 13 — Item 205

### SMALL CONTROL PANEL
A boon to the small building owner, new master control panel is understandable and operable by him. Same quality as larger units. Information available.
Pages 14-15 — Item 206

### DUAL-DUCT BLENDER
For high velocity air conditioning, blender controls volume and holds temperatures without the chance of robbing another space as one space demands more warmth or cooling. Air volume held constant by device that uses the same air for its power. Information available.
Pages 16-17 — Item 207

### COMPLETE VENTING VALVE LINE
Complete line includes venting valves for steam or water, radiators, convectors, baseboards, mains, unit heaters, and process work. All details in catalog.
Page 19 — Item 208

### LINEAR DIFFUSERS
Preserving the clean-line symmetry of modern architectural design these diffusers install on ceiling or side wall. Particularly effective when installed in continuous runs. Catalog is available.
Pages 20-21 — Item 209

### UNIT HEATERS FOR ANY JOB
All types, sizes, and styles of unit heaters to meet any exacting heat requirement are designed and manufactured by this company. Steam, hot water, or gas-fired unit heaters last longer, cost less to install. Bulletins available.
Page 22 — Item 210

**Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.**

### REFRIGERANT CONTROLS
You can size thermo valves more closely with these venturi-flo distributors. There are no nozzles to install or size. One of these replaces distributors requiring up to six or seven nozzles. Bulletin available.
Page 23 — Item 211

### HTW BOILERS
Ultra-modern plant in Frazer, Michigan, doubled its former production capacity and with view toward further expansion installed two of company's controlled circulation hot water boilers for the lowest fuel and maintenance cost. Plant engineer testifies experience confirmed soundness of decision. Catalog available.
Page 26 — Item 212

### SOLENOID VALVES
Company's valves have coil wound with a cross woven insulating layer of cotton thread between each layer of magnet wire, minimizing coil burn out. After winding, it is twice dipped in special varnish and baked assuring perfect moisture-proof seal. Information available.
Page 27 — Item 213

### HORIZONTAL, PROJECTION HEATERS
Exclusive diffusion features give freedom of design and location. Locate where you please and direct heat where needed. Complete line allows specification that is just right for the job. Information is available.
Pages 28-29 — Item 214

### TEMPERATURE REGULATORS
Advantages of packless construction in temperature regulating valves include the elimination of repacking problems, lower maintenance, and accuracy of regulation. This company's units are guaranteed not to wiredraw. A bulletin with piping layouts is available.
Page 30 — Item 215

### BOILER SAFETY CONTROLS BOOK
Company offers new booklet "Basic Safety Controls for Low Pressure Steam Boilers," a companion to its "Basic Safety Controls for Hot Water Space Heating Boilers." Well classified and indexed.
Page 31 — Item 216

### WHEEL MATCHED TO JOB
Complete line of fans permits matching the wheel to the duty whether for ventilating, air conditioning, heating, or processing. Smooth, quiet air delivery at high operating efficiency and dependable service. Information available.
Page 32 — Item 217

### ALUMINUM PIPE AND FITTINGS
New manufacturer's catalog gives helpful information on aluminum pipe, fittings and flange materials. Many man hours can be saved using this line of 12,000 products.
Insert Between Pages 32-33 — Item 218



### INQUIRY CARD

**Circle below item numbers on which you wish catalogs or further information**

| | | | | | | | | | | | | | | | | | | | | |
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**PLEASE PRINT** Oct. H-57

This service available only to U.S. and Canadian readers.

**Name** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** .....**Zone** ....**State** .....

This card is void after Jan. 1, 1958

**SAFETY RELIEF VALVES**
During an emergency these diaphragm operated valves have much greater opening power than the "pop" type valves as their effective operating area is as much as nine times greater. Bulletin available.
Page 33 Item 219

**CLEAN AIR COAST TO COAST**
Instead of selling merely one or two kinds of filters the company sells clean air and manufactures more than a dozen different types of filters to achieve it. Information is available.
Pages 34-35 Item 220

**UNITS CHANGE THEIR OWN FILTERS**
Air conditioning units, industrial unit heaters, and heating and ventilating units all incorporate in them an automatic filtering system that holds a year's supply of filtering material which renews, as needed, automatically. Bulletin explains.
Pages 36-37 Item 221

**HIGH VACUUM ZONE CONTROL**
System increases comfort, cuts fuel costs on Chicago's Lake Meadows project. Designed for comfort, this company's heating products selected for the project include traps, valves, electronic zone controls, and high vacuum pumps. Information available.
Page 38 Item 222

**BALL BEARINGS BOOST SALES**
Manufacturer's ball bearings are designed expressly for residential heating and air conditioning equipment. The bearings feature balls and races especially finished for quiet performance.
Page 39 Item 223

**HIGH VELOCITY FOR SCHOOLS**
All-air high velocity system of draftless air distribution offers many important advantages for heating and ventilating schools. They save space and money, reduce sheet metal required, are installed faster. Diffuser line adaptable to wide variety of architectural designs. Selection manual available.
Pages 40-41 Item 224

**COMBINATION GAS VALVE**
For central heating units, is new concept, incorporating a gas valve, pressure regulator, and safety pilot in compact unit to simplify installation and maintenance. Up to 300,000 Btu. Information available.
Page 42 Item 225

**AXIAL FLOW FANS**
Fans are extremely efficient where duct connections are straight, taking advantage of straight-line axial air flow. Fans eliminate swirling motion of air converting this energy to forward thrust. Bulletin available.
Page 43 Item 226

**SPACE-SAVING SOUND TRAPS**
Greater effectiveness of sound trap permits smaller size ducting and eliminates bulky mufflers. Trouble-free performance can be guaranteed. Details available.
Pages 44-45 Item 227

**SKIN-TIGHT ZINC COATING**
Continuous process zinc coating is uniformly tight and flawless and will stay that way through the toughest fabrication and roughest job-site handling. Booklet available.
Page 47 Item 228

**GLASS FIBER INSULATION**
For fabricated steel buildings insulation must be self-supporting and preferably blanket type, light weight, easy to handle and extremely efficient in insulating against heat loss and absorbing noise. All these qualities found in this company's glass fiber. Bulletins available.
Page 48 Item 229

**CONDENSATE PUMPS**
The company manufactures a pump to meet every heating requirement. Available are condensate, vacuum, turbine, and vertical pumps. Descriptive bulletins on each type are available.
Page 49 Item 230

**SAVE WITH GALVANIZED SHEETS**
Company's non-flaking galvanized sheets become increasingly valuable as fabricated components get longer. No shop hours lost due to flaking off of coating. Information available.
Pages 50-51 Item 231

**MOTORS FOR AIR CONDITIONING**
Commercial air conditioning installations use these quiet motors to avoid resonance or hum induced in the system by the drive motor. Every bearing noise-tested. Housing is resonance-free. Information available.
Page 52 Item 232

**SOLVE AIR HANDLING PROBLEMS**
Three maximum efficiency units: For standard duty and heavy industrial use, for continuous service and efficient operation and a heavy duty heat surface. Bulletins available.
Page 53 Item 233

**PNEUMATIC CONTROL SYSTEMS**
Literature is offered describing company's thermostats which maintain effective temperatures regulating temperature in proportion to humidity changes. Ad discusses application at Harold's Club in Reno.
Pages 54-55 Item 234

**PACKAGED AUTOMATIC BOILER**
Company's bulletin describes its fire-tested, performance guaranteed boilers. Rated not on square feet of heating surface but on its own test-floor performance. Has spinning gas feature.
Page 56 Item 235

**COPPER-BEARING SHEETS**
New Orleans City Hall, illustrated, used company's copper-bearing galvanized sheets for long-lasting, trouble-free operation. Lasts up to 33 times longer. Information available.
Page 57 Item 236

**UNDERGROUND PIPE INSULATION**
Insulation is poured in the trench around and under the pipes. Upon curing it forms a permanent 3-zone system, a protective barrier against heat loss, water, and corrosion. Literature available.
Page 58 Item 237

**QUIET ELECTRIC UNIT HEATERS**
Heating is quick, clean, automatic and as dependable as the power that flows through non-glowing heat elements. Heavy duty construction. Built in over-heat protection. Nine sizes. Bulletin available.
Page 59 Item 238

**DRAFT-FREE AIR DISTRIBUTION**
Chart shows typical results which can be predicted with this company's ceiling diffusers. Primary air mixing throughout entire length of throw. Information available.
Page 62 Item 239

**INDUSTRIAL UNIT HEATERS**
A broad line of industrial unit heaters, with wide range of sizes and capacities, versatile, of rugged construction and good appearance is guaranteed by manufacturer with 40 successful years behind him. Four models are illustrated. Bulletins available.
Page 63 Item 240

**AIR CONDITIONING EQUIPMENT**
Engineers can choose from 287 models, each at economical standard model cost. Packaged conditioners, central system centrifugal chillers, room air conditioners etc. Information available.
Page 64 Item 241

**AMERICAN COPPER TUBING**
Copper tubing manufacturer urges you to buy American quality tubing and pipe to maintain United States economy. Literature on copper tubing available.
Page 65 Item 242

**MOTORS FOR FANS**
Reduce down time on fan installations with these dependable motors which have more cooling surface, iron, copper, and lubrication provisions. Information available.
Page 66 Item 243

**BRONZE VALVE CATALOG**
Leading manufacturer of bronze valves offers company's catalog which includes description of complete selection of copper-to-copper valves, heating specialties, and heavy-duty valves—more than 500 separate bronze valves.
Page 67 Item 244

**AIR CONDITIONING LINE**
In business for 103 years, company maintains profitable relationship with its franchise holders. Equipment includes packaged units, liquid chillers, air compressors, condensing units. Details available.
Page 68 Item 245

**EXPANSION JOINTS**
It is better to use these expansion joints instead of pipe bends because there is less heat loss, less pressure drop, less space consumed and they are less costly. Packless, they require no maintenance. Information is available.
Page 69 Item 246

**MAINTENANCE-FREE STEEL PIPE**
Long, maintenance-free life for radiant heating installations is promised with use of this company's steel pipe. Uniform ductability, lengths, threading, weldability, wall thickness, strength, toughness, roundness and straightness are reasons why you should specify.
Page 70 Item 247

**REMOTE AIR COOLED CONDENSERS**
Said to be the most efficient, versatile and complete line of remote air cooled condensers on the market, they come in direct drive models for commercial and industrial air conditioning and refrigeration and belt driven models to 30 tons. Information available.
Page 71 Item 248

**CAST IRON GAS-FIRED BOILERS**
In school installation illustrated, company's boiler proves of extra value. Installing contractor found installation went very smoothly. Tests proved unit was very efficient. Literature available.
Page 72 Item 249



Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U.S.

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 58, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

### COOLING TOWERS ARE POPULAR
There are more of this company's cooling towers in service in high-rise buildings than any other because of their dependable performance, attractive appearance, and diversity of models. Information available.
Page 73 Item 250

### PACKAGED FIRING UNITS
Brantford, Ontario farms saved $10,478 in one year after installation of this company's forced draft oil burners with matched boilers. Combustion system includes burner, control panel, forced draft air supply and fuel system, wired and tested. Specifications available.
Page 121 Item 251

### GAS-OIL BURNERS
For economical installation and low fuel bills company's burners are equipped with factory tested combustion chamber and air intake register for maximum combustion efficiency at all firing rates. Specifications available.
Page 129 Item 252

### INDUSTRIAL HEATERS—24 SIZES
Rugged industrial heaters afford 8-coil selections and 150 ratings to 2,500,000 Btu per hr, to 25,000 cfm each. General purpose models have non-ferrous heating coils, heavy duty heater has wrought iron coils. Information available.
Page 131 Item 253

### SEWAGE PUMPS
In new 375 Park Avenue building, New York, which uses only the highest quality materials and workmanship, they use this company's sewage pumps for continuous trouble-free waste disposal service. Over 13,000 sold. Not one has ever clogged. Information available.
Page 133 Item 254

### STORAGE HEATERS AND TANKS
Designed to meet the hot water needs of huge District of Columbia Hospital Center, they supply thousands of gallons of hospital-pure hot water. Information is available.
Page 135 Item 255

### HEATING AND VENTILATING UNITS
This company's equipment can produce balanced comfort for large areas economically and practically. Details of Douglas Aircraft installation described. Information available.
Page 137 Item 256

### ENGINEERED FILTERS
For air conditioning and ventilating equipment, machines, compressors, or any device using air or liquid, this company has a filter engineered to solve the particular filter problem. All-line catalog available.
Page 139 Item 257

### HERMETIC CONDENSING UNITS
With no belt, seals, or manual oiling, 90% of service costs are eliminated on these compressor units which are available in air cooled models from 1/3 to 5 hp and in water-cooled models from 1/3 to 10 hp. Information available.
Page 141 Item 258

### CONTINUOUS STRIP DIFFUSERS
The only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill that blends with interior. Can be hidden in lighting coves. Information available.
Page 143 Item 259

### ROOF VENTILATION ENGINEERING
The line of roof ventilators made by this company includes a low contour model, a large volume model for high velocities, wind driven turbine types and exhaust fans for corrosive fumes. Catalog with specifications and performance data is available.
Page 143 Item 260

### STEAM TRAPS VENT AIR RAPIDLY
A steam heating system will be more valuable if obsolete traps are replaced by these corrosion resistant steam traps. Heater reaches full operating efficiency almost instantly. Selector booklet available.
Page 144 Item 261

**Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.**

### VALVES FOR PROCESS CONTROL
Illustrated are iron body gate valves and bronze gate valves used on air conditioning system in new Ethicon, Inc., subsidiary of Johnson & Johnson, home office and main finishing plant. Absolute control for processing is achieved. Information available.
Page 145 Item 262

### PUMPS WITHOUT STUFFING BOXES
Gone are the conventional packed stuffing boxes. Double mechanical shaft seals are standard equipment. They are self-adjusting, effectively preventing leakage. Cartridge type bearings need no lubrication. Bulletin available.
Page 146 Item 263

### DUCT FANS CUT COST
Belt drive duct fan, for corrosive fumes, bi-pass duct fans for high temperature corrosive fumes and air, and reversible duct fans to move air in either direction with equal efficiency are described. Complete details are contained in bulletin.
Page 147 Item 264

### GAS UNIT HEATERS
Cost of these unit heaters is comparable to or lower than that of other types of equipment of equal heating capacity, and this is the total cost. Information is available.
Page 148 Item 265

### HEATING SPECIALTIES
Success of steam distribution system can hinge on things small as radiator traps. Company's models permanently adjusted to close tight on steam, open promptly to pass air or condensate. Catalog covers traps, packless valves, duct traps, venting valves.
Page 149 Item 266

### UNION BONNET GATE VALVES
Two-piece union bonnet construction provides extra easy assembly and disassembly. Recommended for general service on steam, water, gas, and oil lines where unrestricted flow is desired. Illustrated brochure fully describes.
Page 150 Item 267

### CENTRIFUGAL ROOF EXHAUSTERS
This company's lo-boy centrifugal roof exhausters enhance the beauty of building skylines. Forward or backward curve wheel within or out of scroll housing. Bulletin available.
Page 152 Item 268

### REGISTERS AND GRILLES
This company's line of registers and grilles includes perimeter baseboard diffusers, perimeter baseboard registers, perimeter floor registers, and ceiling air diffusers. Catalog is available.
Page 153 Item 269

### FANS WITH ALUMINUM BLADES
Extruded aluminum blades combine in one design the advantages of a light weight metal, a hollow structure, and the superior strength of wrought metal. Easily assembled in the tower, fan requires no special handling equipment.
Page 154 Item 270

### ANCHORS BITE CONCRETE
Bit-anchor combination bites into concrete in seconds. Will anchor anything permanently. Holds up to 3150 pounds in ¼ inch size, 19,620 pounds in ⅞ inch sizes. Free sample available.
Page 154 Item 271

### MOTOR SHRUNK ONE FULL INCH
A more compact motor for new, thin air conditioners is only 3⅛ inches long, 1/12 hp, 4-pole. Information available.
Page 155 Item 272

### FLEXIBLE EXHAUST HOSE
Made of strong Neoprene-coated cotton or Nylon fabrics spiral-wire reinforced, hose is installed for dust control, particularly at elbows and moving hoods. Information available.
Page 156 Item 273

### SPIRAL PIPE AND FITTINGS
Spiral pipe, matched fittings, and sound absorbers are custom made to cut costs and quicken pin-point estimates for high velocity air movement systems. Catalog shows detailed specifications and applications.
Page 156 Item 274

### WELDING PIPING MATERIAL
Fittings, flanges, valves, nipples and pipe are available from a single source of uniform quality. Each item inspected to guarantee uniform size, wall thickness, and dimensional accuracy for a good welding job. Circular available.
Page 157 Item 275

### CONTROLLED HUMIDITY
Air conditioning method removes moisture from air by contact with a liquid in a small spray chamber. Heating and cooling separate. Precise humidity under any conditions. Bulletins available.
Page 158 Item 276

### SCOTCH TYPE PACKAGED BOILERS
Now available as completely packaged units are standard types with wind box, ready for fast, on-the-job delivery by company's special trailer trucks that assure fast delivery and efficient unloading. Information available.
Page 159 Item 277



## INQUIRY CARD

**Circle below item numbers on which you wish catalogs or further information**

| | | | | | | | | | | | | | | | | | | | | | |
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**PLEASE PRINT** Oct. H-57

This service available only to U.S. and Canadian readers.

**Name** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** .....**Zone** ....**State** .....

This card is void after Jan. 1, 1958

# Ad-Digest

**FURNACES**
Three of company's units with total air delivery of 120,000 cfm and 14,250,000 Btu input specified in new litho plant to supply large volume of fresh outside air replacing oxygen consumed by lithograph equipment. Information available.
Page 160 Item 278

**FAIL-SAFE MIXING VALVE**
Thermostatic mixing valve for water has replaceable cartridge which houses all working parts. Never needs to be removed from line for costly servicing. Corrosion free. Information available.
Page 162 Item 279

**POWER EXHAUSTERS**
Said to be the world's most efficient, these exhausters have no motors, fans, or bearings in exhaust line; need no stacks; and have acid resisting enamel finish. Engineering data available.
Page 163 Item 280

**AIR CONDITIONING EQUIPMENT**
Twenty-eight full lines of air conditioning equipment are itemized in advertisement. Includes room air conditioners, air handling units, multi-zone types, packaged water chillers, coils, cooling towers, etc. Bulletins offered.
Page 164 Item 281

**QUIET, DEPENDABLE BLOWERS**
A minimum of installation space is required and mounting costs are reduced by these units which are wholly built by the company, including the motor. Three bulletins available.
Page 165 Item 282

**CONDENSATE PUMPS**
You are invited to compare. All are built to give a lifetime of service with only routine maintenance. Specially designed mechanical seals eliminate stuffing boxes, frequent adjustment. Information available.
Page 166 Item 283

**POSITIVE SEALING INDICATORS**
Proven on thousands of production line installations, indicators have one piece extension gasket for positive sealing and fool-proof assembly. Complete line catalog available.
Page 167 Item 284

**INDICATORS AND TANK GAGES**
Manufacturer features instruments for liquid depth measurement and remote indication of specific gravity. Two bulletins are available.
Page 167 Item 285

**INTERIOR FIRE PROTECTION**
Manufacturer's interior fire protection line more than meets specifications. It also meets the highest standards of safety plus design, practicality and economy. Bulletin is available.
Page 168 Item 286

**THREE TYPES OF AIR FILTER GAGES**
No dime store gadgets, these gages are built for a lifetime of dependable service: Inclined tube type, diaphragm actuated dial type, and bell actuated dial type. Bulletin available.
Page 168 Item 287

**VERSATILE SUBMERSIBLE PUMPS**
Hundreds of applications are possible because of pump's large capacity, compactness, low center of gravity, portability, and submersible features. Among them are: basement sump pump, coolant circulation, septic tanks. Up to 5000 gph.
Page 169 Item 288

**ELECTRIC AIR DUCT HEATERS**
For heating air under forced circulation these electric air duct heaters are efficient, economical. Heaters can be installed easily in round or rectangular ducts and accurately controlled either manually or by automatic thermostat. Bulletin is available.
Page 169 Item 289

**FLOAT CATALOG**
Company is prepared to solve liquid level control problems involving floats. Catalog provides complete technical data on types, sizes and suitable metals. Made in a variety of metals in sizes from 2½ to 14 inches.
Page 169 Item 290

**BACKWATER VALVES**
Basement flooding caused by back pressure from street sewers can be ended with this company's backwater valves. Manually operated spade valve and automatic swing valve are features. Catalog available.
Page 170 Item 291

**ALL-ALUMINUM VENTILATORS**
Direct drive and belt driven ventilators of all-aluminum construction are offered. Low silhouette design in both. Light starting torque increases bearing motor life. Catalog available.
Page 170 Item 292

**IN-DUCT HUMIDIFIERS**
Honest humidification for real winter air conditioning. Data including details on the product, its application, and how to develop this new business sent without obligation.
Page 170 Item 293

**DIRECT READING VELOMETER**
Measures actual air delivery. Simple, direct reading gives instant measurement in any distribution system. Compact, portable, easy to understand and to use. Bulletin available.
Page 171 Item 294

**WEATHER RESET TIME SWITCH**
This weather reset time switch has automatic, positive heat control that no other system can offer. The time of shift from night to day thermostat changes automatically with every degree change in outdoor temperature. Information is available.
Page 171 Item 295

**HUMIDIFYING SPRAY NOZZLES**
For your convenience spray nozzles and related accessories for humidifying are available from a single dependable source. For industrial installations everything but piping, wiring, and compressor is provided. Bulletin is available.
Page 171 Item 296

**CATALOG ON INDUSTRIAL PUMPS**
One reliable source for thousands of pumping needs: This company offers its catalog, an up to date working tool for useful information on a wide variety of standardized pumps for a multitude of applications.
Page 172 Item 297

**AIR VELOCITY METER**
An air meter is made by this manufacturer for checking velocities from 400 to 10,000 fpm and static pressures from 0 to 10 in. Kit includes manometer, stainless steel pitot tube, magnetic holding clips, necessary fittings and tubings. Literature and prices are available.
Page 173 Item 298

**FORCED DRAFT COOLING TOWERS**
Company lists four representatives for its new forced draft cooling tower. Literature available.
Page 173 Item 299

**VIBRATION CONTROL**
The manufacturer's complete line of products provides an answer to any installation, vibration, or noise problem. Bulletin is available.
Page 174 Item 300

**WHISPER QUIET COOLING TOWERS**
Because it is so quiet, you can install this cooling tower anywhere. Its low silhouette is seldom visible at street level. Internal redwood nailless decking. Bulletins available.
Page 175 Item 301

**TUNNEL CONDUIT SYSTEM**
Permanent protection for the life of the piping in underground service is possible with this system made of vitrified clay. Chemically inert, it cannot rust, rot, corrode, or decay. Illustrated circular contains complete installation specifications.
Page 176 Item 302

**FANS, CONDITIONERS, VENTILATORS**
Company's units shown in Pennsylvania Wyeth Laboratories, Inc. installation, including system fans, air conditioning units, ventilating sets. Information available.
Inside Back Cover Item 303

**AIR FLOW CONTROLLER**
New unit for high velocity, double duct systems provides positive, constant volume control, eliminates costly manual balancing and is designed for leading makes of mixing units. Details available.
Back Cover Item 304



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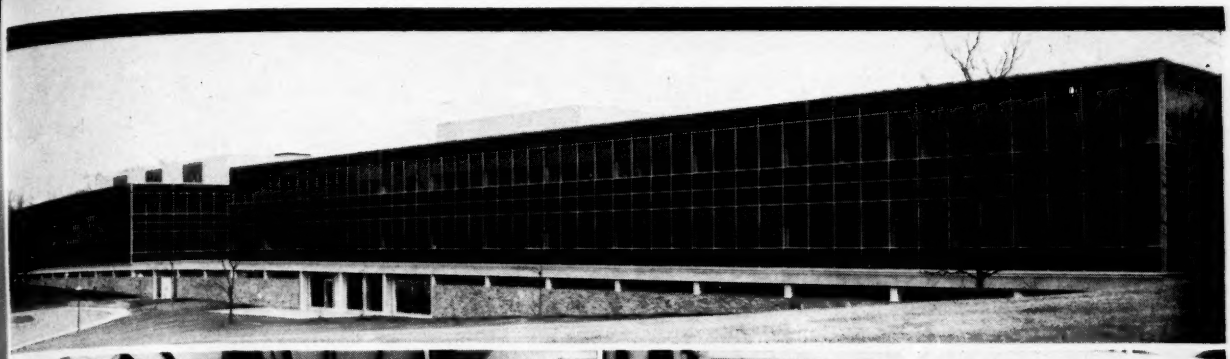
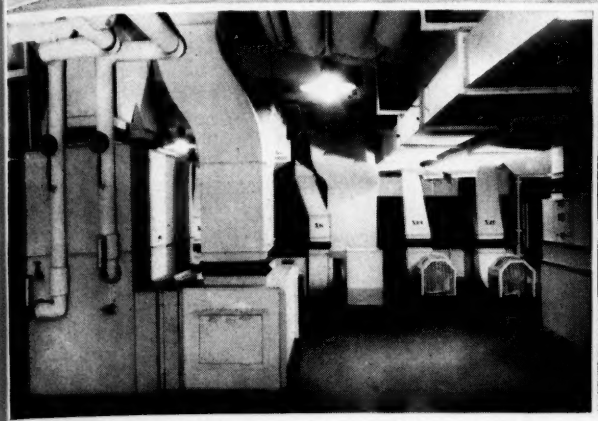
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

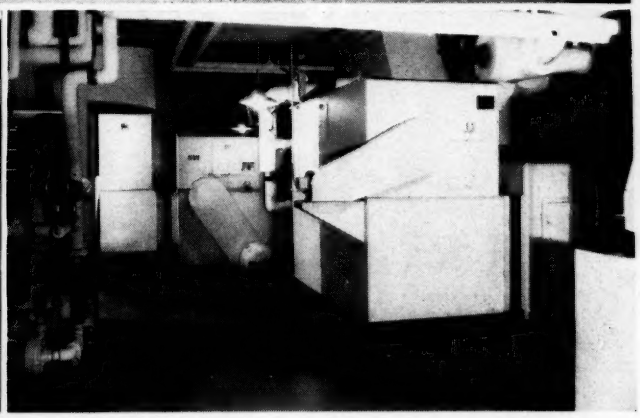
AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE



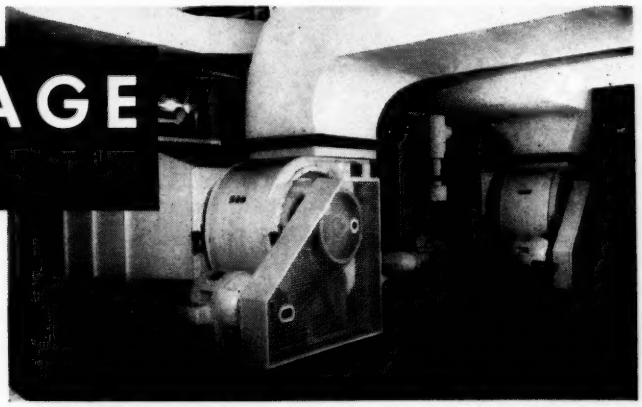


*On left, Clarage Multitherm supplying conditioned air to the electrophoresis balance room. Exhaust fans in background.*



*In foreground, Multitherm supplying make-up air exhausted by laboratory hoods.*

# AIR via CLARAGE



*Type HV fans supplying air to dining room and office interior.*

One of the most modern of its type, this virtually window-lined building at Radnor, Pennsylvania serves Wyeth Laboratories, Inc.

As for so many other notable installations, Clarage equipment was chosen for the air handling and conditioning — Clarage Type NH and Type HV system fans, Multitherm air conditioning units, Ready Unit ventilating sets.

Clarage equipment has a long-standing reputation for doing the job quietly, economically, and dependably in buildings of all types, all sizes. Make sure *your* investment in air handling and conditioning is a profitable one by choosing Clarage quality.

**ARCHITECT:**
Skidmore, Owings & Merrill — New York City.

**ENGINEER:**
Seelye, Stevenson, Value & Knecht—New York City.

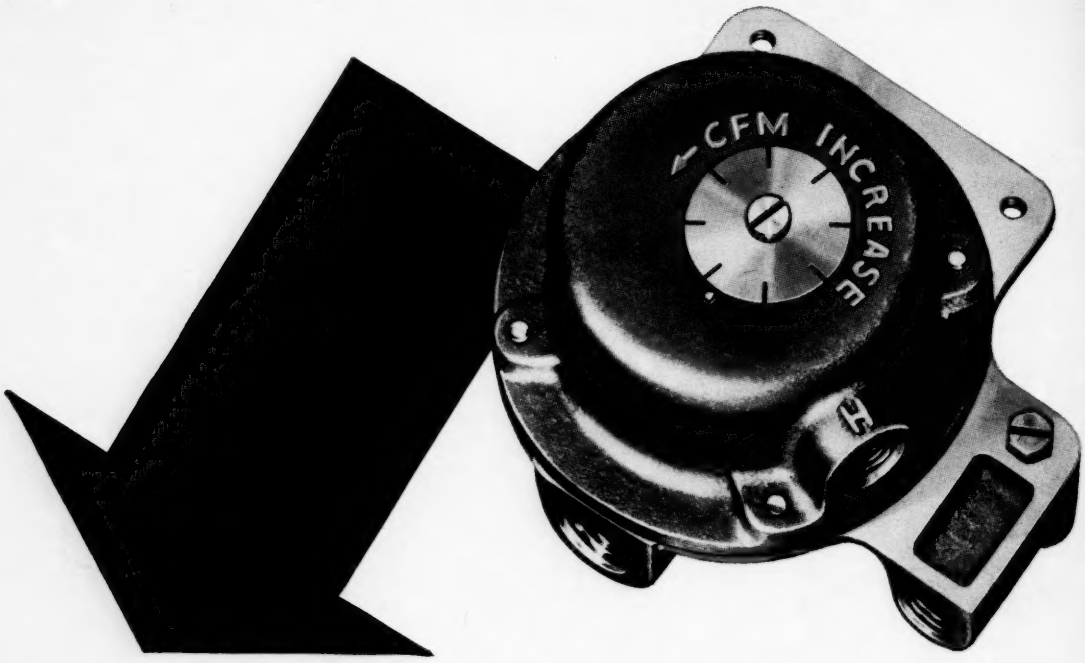
**GENERAL CONTRACTOR:**
George A. Fuller Co. — New York City.

**MECHANICAL CONTRACTOR:**
W. M. Anderson Co. — Philadelphia, Pa.

## CLARAGE FAN COMPANY Kalamazoo, Mich.

***. . . dependable equipment for making air your servant***

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal




# JOHNSON *AIR FLOW* CONTROLLER FOR HIGH VELOCITY, DOUBLE DUCT SYSTEMS

- **Provides Positive Constant Volume Control**
- **Eliminates Costly Manual Balancing**
- **Designed for Leading Makes of Mixing Units**

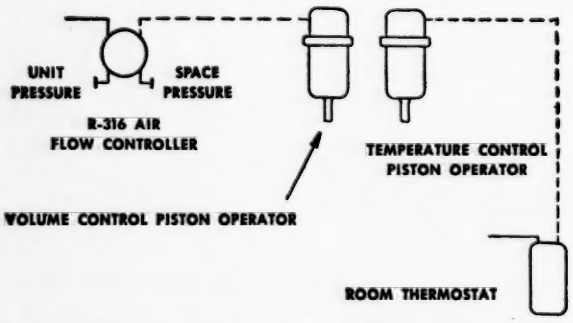
The Johnson R-316 Air Flow Controller for high velocity, high pressure, double duct air conditioning systems provides accurate, constant volume air distribution through every unit in the system, regardless of the number of mixing units, length of duct runs or differences in pressures between the hot and cold ducts.

With the R-316, comfort is complete, uninterrupted. There are no variations in sound levels. You completely eliminate costly and difficult manual balancing. Systems remain in perfect balance at all times.

The power source of the R-316 is taken from the filtered, dehumidified control air supply system. The use of this air power source eliminates problems arising from residual dirt in the duct distribution system and dirt-contaminated duct air. Moreover, it allows the static pressure of the air distribution system to be maintain at the minimum pressure required for proper air di bution, without the necessity of maintaining a hi pressure for instrument operation. *This is an impor economic factor in initial fan cost, fan horsepower c sumption and duct design.*

The R-316 operates at any pressure difference fr approximately 0 to 1 inch wg and will produce a 1 air pressure change on pressure difference change less than .005 inch wg.

If your plans call for high velocity, double duct conditioning, a Johnson Pneumatic Control Sys with provision for constant volume control will help y produce incomparable results. Ask your local John branch for complete details or mail the coupon.




Typical temperature-volume control arrangement for a high velocity mixing unit. R-316 Air Flow Controller insures delivery of a constant volume of air, compensates perfectly, *instantly*, for variations in inlet pressure of hot and cold air supply.

**JOHNSON CONTROL**

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 19

**JOHNSON SERVICE COMPANY**

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Please furnish details on your new R-316 Air Flow Controller.

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Company_____

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